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AGRICULTURAL RESEARCH INSTITUTE
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ROYAL BOTANIC GARDENS

Kew Bulletin

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Kew Bulletin

PUBLISHED FOR THE ROYAL BOTANIC GARDENS, KEW
FORMERLY THE "BULLETIN OF MISCELLANEOUS INFORMATION"

No. 1, 1950

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1949.

General

The Director continues to serve on the various bodies to which reference has been made in previous reports. His period of office as a member of the Council of the Royal Horticultural Society terminated in February. The Director was again appointed a Vice-President of the Royal Society and Vice Chairman of the Agricultural Improvement Council, he has also served during the past eighteen months as Acting Chairman of the Colonial Agricultural Research Committee. As Fullerton Professor of the Royal Institution the Director delivered a course of four lectures on the Geographical elements in the British Flora and an evening discourse on the subject of " Leaves ".

On July 9th the Director left for Australia as leader of a British Delegation appointed by the Agricultural Research Council to attend the Commonwealth Conference on Nutrition held in Adelaide during August. Prior to the Conference itself he had the opportunity of discussions with the Governor of Western Australia, the Premier and the Minister of Agriculture and was able to make recommendations respecting the provision of a botanical garden there. A potential site for such was inspected which would serve admirably to establish a collection of the extremely rich and scientifically interesting native flora. The Government Botanist, Mr. Gardner is doing first class work and has amassed a most valuable herbarium, but this is quite inadequately housed under conditions so cramped as to seriously hamper the work, and which present a high fire risk. Moreover, the wholly insufficient assistance which Mr. Gardner can command impairs progress on a flora of which the State has every right to be proud and this condition of affairs is moreover wasteful of the services of the Government Botanist whose remarkable knowledge of the flora was manifest in a trip of six days that the Director was able to make in his company to the arid areas in the regions of Merridin, Southern Cross and Wogan Hills. At the end of the Director's tour he made a second trip in Mr. Gardner's company to the south western parts of Western Australia to see the giant Gum forests and *Cephalotus* in its native haunts. During this trip the Director found *Phylloglossum* in a new locality and some very rare endemic species were seen in bloom including *Hodgsoniola junciformis*.

Before leaving Perth the Director visited the University where he and his colleagues were entertained by the Vice-Chancellor and the Director gave an address to the University Staff.

The Nullabor plain was crossed by train and after flying from Adelaide to Melbourne the Director and some of his colleagues made a tour of inspection of the irrigated areas of the Murray valley where examples of various mineral deficiencies were exhibited and various research establishments were inspected.

During the Conference at Adelaide the Director visited the Botanical Gardens under the admirable care of Mr. Lothian with whom he discussed his problems. The Curator's chief difficulty is lack of space rendered more acute by the replication of common species of trees. On the evening of August 24th the Director delivered a public lecture on Kew Gardens and it was gratifying to find how widespread was the interest in our Institution. Before leaving Adelaide the Director paid his respects to the doyen of Australian botany, Mr. Black, the 94 year old author of the South Australian Flora, who it was a pleasure to find actively engaged on the second edition.

After the Congress there was an official tour of some 1,200 miles to inspect features of agricultural interest in the course of which the Melbourne Botanic Gardens were visited. Here the Herbarium in charge of Mr. Jessop is the best housed in the Commonwealth but there is an inadequate staff. The garden of some 100 acres has a considerable collection of trees and shrubs including a number of native species. When there the Director was requested to plant a *Podocarpus* to commemorate his visit. Before leaving Melbourne a day was spent in the admirable national reserve with Mr. Jessop.

The Conference meetings terminated at Canberra and here also the Director delivered a lecture and together with the Premier, Mr. Chiffley, was invited to plant a tree on the site of what is to be the Commonwealth Botanical Garden. This site was inspected and its potentialities discussed with Mr. Pryor, whose knowledge and enthusiasm can be relied upon to develop this beautiful area as a sanctuary primarily for the rich Australian Flora. At Melbourne the Director, as Chairman of the Forest Products Research Committee in this country, paid a visit to the Forest Products Research Institute of the C.S.I.R.O.

The Director travelled by plane to Sydney where under Mr. Anderson's guidance he explored the gardens and visited the Herbarium. Both these require more accommodation for though the Botanical Gardens appear not unduly cramped much of the space they occupy has so shallow a soil above the rock that it has a very limited value. Two of the State Nature Reserves were visited in company with Mr. Anderson and members of Staff and the Chief Ranger. These magnificant areas of many thousands of acres embrace a rich flora and provide national monuments of the first importance with potentialities for scientific investigation that it would be difficult to over-rate and folly to ignore. The far sighted policy that led to their reservation by the State cannot be too highly praised. The universities and several of the agricultural institutions were visited and here as elsewhere opportunities afforded of discussion with Ministers and other officials concerning educational and scientific problems.

From Sydney the Director flew to Brisbane whence an extended tour was made under the guidance of Dr. Summervill and Prof. Herbert to visit the sugar cane areas and the tropical forest research station at Maroochy, where investigations are carried out on the breeding of Pineapples and Pawpaw in particular. The Director also visited the magnificent forest reservation which is the native home of *Araucaria cunninghami*, as well as the Wheat Research Station and the soil erosion experimental station.

The Herbarium at Brisbane has accommodation that is far too small which is the more unfortunate having regard to the ability of the Government Botanist, Mr. C. T. White. The co-called Botanical Garden was some years back handed over to the City so that it has become more a public park than a scientific adjunct and unless it be again taken over by the State and placed under the care of the Government Botanist, it is unlikely that it will fulfil its proper function.

A day was spent with Mr. White and his assistant, Mr. Francis, on Mt. Glorious, where there is a fine example of tropical rain forest rich in number of arborescent species and with more epiphytes than might be expected with only about 60 ins. of rainfall. The Director returned by plane from Brisbane to Adelaide on 27th September and traversing the Nullabor plain once more by train spent a further week in Western Australia, as already mentioned. The total distance traversed by air, by rail, and especially by car, amounted to many thousands of miles and not only was a large area thus visited but the arrangements made by the officials of the C.S.I.R.O. by the Governors and Ministers and their staffs in the various States of the Commonwealth were so thorough and all these and other officials gave so generously of their time that it became possible to meet and discuss problems with many of those most actively concerned with science and agriculture over a range of interests that in retrospect is almost incredible.

The names mentioned in this account have been mainly those connected with the more strictly botanical aspects of the visit but such selection though appropriate to this journal is somewhat invidious and the Director would wish to place on record his deep appreciation of the warmth of his welcome by all with whom he came in contact and the kindness he received from those, far too numerous to mention, who contributed alike to his mental and material welfare.

Dr. W. B. Turrill, Keeper of the Herbarium, has been elected President of the Botany Section, British Association for the Advancement of Science, for 1950.

The following appointments during the year are recorded :—

Appointment as Scientific Officer :—
S. G. Harrison, B.Sc.

Appointment as Assistant (Scientific) :—
Miss Joan Foster.

The Herbarium

There has been a considerable increase in the amount of research carried out in the Herbarium during the past twelve months. In accordance with the arrangement made by the Director with the Colonial Office, in connection with the Flora of Tropical East Africa, Mr. J. B. Gillett and Mr. R. B. Drummond have been appointed as botanists, and Miss D. R. Thompson has been appointed as artist, to assist in the preparation of this work.

The Keeper of the Herbarium and Library and Mr. Milne-Redhead are acting as editors and have prepared a scheme for the format of the Flora which is being tested in the working out of a moderately sized family.

The amount of routine work carried out during the year is indicated in part, by the following figures :

Specimens received 38,879 ; specimens borrowed 7,989 ; specimens sent on loan 4,518 ; specimens distributed as duplicates 5,148 ; sheets mounted 34,681.

Laying in has approximately kept up with the number of sheets mounted.

Visits paid to the Herbarium and Library by botanists numbered 4,184.

The following botanists, amongst others, have carried out research, often for long periods, on the groups or subjects named :

C. H. Andreas (*Alisma*) ; I. H. Burkill (*Dioscorea*) ; E. A. Chenery (aluminium in plants) ; P. H. Davis (Flora of Asia Minor) ; W. P. Fang (Flora of China) ; I. P. Fanning (*Narcissus*) ; E. Hultén (Flora of Alaska) ; G. Jackson (Flora of Nyasaland) ; G. J. Lewis (Flora of S. Africa) ; A. Lourteig (Flora of Argentina) ; F. Markgraf (*Gnetum*) ; F. G. Meyer (*Valeriana*, etc.) ; I. Reichert (Fungi) ; R. A. Silow (*Gossypium*) ; W. T. Stearn (*Lilium*, etc.) ; P. C. Tsoong (Flora of China) ; J. Whittaker (Flora of Iceland).

The scientific staff continue to be indebted to Col. E. Armstrong and Mr. W. C. Worsdell for their assistance in the translation of papers from various foreign languages. Miss M. M. Whiting has continued to give valuable voluntary service in re-arranging material from the Indian sub-continent and Malaysia. Miss S. Wilson has helped greatly to keep the laying-in of the collection of drawings up-to-date. Dr. J. Hutchinson has worked in the Herbarium especially on British plants.

During the year a total of 2,183 enquiries and plant consignments has been dealt with. The higher standard of collecting noted in last year's report has been maintained.

Europe, Orient, and North Africa. Work has continued on E. R. Guest's collections from Iraq and on Mrs. Dickson's collections from Kuwait. Research on desert species of *Heliotropium* and on Cyprus species of *Origanum* promises very interesting results. A detailed investigation of *Vicia monantha* has been made and a revision of *Ricotia* almost completed. Important additions to the collections have been received from Sweden, Holland, Denmark, Asia Minor, Cyprus, Arabia, Persia, and Egypt.

British plants have been presented by J. E. Lousely, C. A. Sinker, T. A. Sprague, the Botanical Society of the British Isles, and many members of the Kew staff.

China and Japan. Many plants from China in cultivation in British gardens have been determined. Some of these determinations necessitated considerable revision. Research has been concentrated on *Lilium*, *Nomocharis*, and *Camellia.*

India. Dr. D. Chatterjee, Assistant for India, returned to Delhi on 11th March 1949. No one has been appointed in his place.

Malaysia. Further special requests for the determination of material, in connection with timber samples, were received from the Conservator of Forests, North Borneo, and, with the exception of the *Dipterocarpaceae*, were dealt with. No further work was done on the Oxford University Expedition's outstanding material from Sarawak, but considerable preliminary study was made of material of *Gonystylus* and *Pentaphragma* received on loan from Buitenzorg, Singapore, Kepong, and Washington, in connection with the Flora Malesiana, and a paper on some of the new species of *Gonystylus* detected has gone to press. The Malaysian material of *Ixora* was kindly rearranged by Miss M. M. Whiting in accordance with Bremekamp's revision.

Tropical Africa. Progress is being made in naming and incorporating the large numbers of specimens which accumulated during the war years, whilst excellent collections which continue to come in are being dealt with as quickly as possible. Particular reference should be made to collections from Sierra Leone (F. C. Deighton and others), Liberia and French Guinea (J. T. Baldwin jr.), Nigeria (R. W. J. Keay), Belgian Congo (R. Germain), Uganda (W. J. Eggeling and J. W. Purseglove), Eritrea, Somaliland, and Kenya (P. R. O. Bally), Kenya (A. Bogdan and E. M. Tweedie), Tanganyika (P. J. Greenway and R. M. Hornby), Nyasaland (P. O. Wiehe), Portuguese East Africa (H. G. Faulkner and G. Pedro), N. Rhodesia (A. W. Cruse), S. Rhodesia (H. Wild), Angola (J. Gossweiler), and Bechuanaland (O. B. Miller). In addition many smaller, but valuable collections have been received from other correspondents and from the National Herbarium, Pretoria. Valuable duplicates in exchange have been received from Brussels, Paris, and Coimbra.

Researches on the groups mentioned in the Review for 1948 (K.B. 1949, 4 : 1949) continue. In addition *Aneilema*, *Zornia*, *Trifolium*, and *Rhus* have been critically investigated. Dr. Bremekamp (Utrecht) has continued his revision of African *Oldenlandia*, and Prof. Suessenguth (Munich) has determined many African *Amarantaceae* for us.

Good progress has been made with the account of L. J. Brass's plants collected on the Vernay Nyasaland Expedition, 1946. Help has also been given to Dr. F. W. Andrews in his revision of the Flora of the Anglo-Egyptian Sudan.

The year's attachment of Mr. B. Verdcourt ended in September, and he proceeded to Amani to take up his duties as Botanist at the East African Agricultural and Forestry Organization.

Other botanists who have been attached to Kew for experience in Herbarium methods are Mr. H. G. Dawkins (Uganda Forestry Department), Mr. J. R. Welch (Tsetse Research Department), Mr. G. Jackson (Agricultural Probationer to the Colonial Office) and Mr. J. G. Andoh (Gold Coast Forestry Department).

Visitors working on tropical African plants included Dr. J. T. Baldwin jr., Dr. F. A. Mendonca, Dr. A. R. Torre, Mr. R. W. J. Keay, Dr. F. W. Andrews, Mr. K. R. Mayer, Dr. A. Katz, and Mr. F. C. Deighton.

South Africa. Valuable consignments of specimens have been received from the National Herbarium of Pretoria, from the Bolus Herbarium, Cape Town, and from private individuals. The compilation of a bibliography of South African botany has been completed by Mr. Bullock and awaits publication. Miss P. Kies has worked sespecially on *Compositae* and *Liliaceae.*

America. The botanist in charge has tried to give priority to work on collections or special consignments from British Guiana and Trinidad. He has worked on the collections of the British Guiana Forest Department, and also named the collection made by the Italian Expedition to British Guiana, about 1930, in response to a request by Prof. Pichi-Sermolli. Several consignments from the Imperial College Herbarium, Trinidad, have been dealt with, and the ms. of Mr. Simmonds's work on monocotyledons for the Flora of Trinidad and Tobago has been revised. A small collection from Venezulian Guiana has also been named. Small consignments from British Honduras and Dominica have also been identified.

So far as time has permitted, progress has been made with the naming of the large and important collections made by Mr. C. Sandeman in Colombia.

An extensive series of cultivated passifloras sent in from Amani by Mr. P. G. Greenway was named for the African Department.

Special work on *Bignoniaceae* :

(a) The mss. of the account for the Flora of Trinidad and Tobago is now in hand, and well on the way to completion.

(b) A large consignment sent from Argentina has been identified.

(c) Small consignments sent from Ecuador and Brazil have been named.

Australasia (including New Zealand, Oceania, and New Guinea). Most of the work consisted in answering queries, but work was continued on naming and incorporating the immense Western Australian herbarium of Dr. A. Morrison. In conjunction with Mr. Fanning a number of cultivated eucalypts from Ireland, the Riviera, and elsewhere were studied. The gatherings made by the Rev. N. E. G. Crutterell in Papua in 1947 and 1948 were named; these contained many high altitude gatherings of especial interest.

Research on Fiji, Solomon Islands, and New Guinea *Ficus* was continued as far as time permitted.

Miss Lewis commenced a critical examination of the Australian Composite genus *Pithocarpa* on which it is hoped to publish a joint paper.

Orchidaceae. Routine naming of specimens from the Gardens and from various geographical areas was carried on actively. These were to a large extent African, among them being collections from French Guiana by R. Schnell, Uganda by W. J. Eggeling and J. W. Purseglove, and S. Rhodesia by F. C. Greatrex.

Research was continued on African orchids, particularly *Habenaria*, *Bonatea*, and various Angraecoid genera.

Glumiflorae. The main work on the group, as in previous years, has been the naming of numerous specimens (+ 3,000), mainly from Tropical Africa. These include valuable collections from Sierra Leone, Liberia, Gold Coast, Nigeria, French Central Africa, Anglo-Egytian Sudan, Abyssinia, Kenya Colony, Nyasaland, Southern Rhodesia, and South Africa. From these or earlier acquisitions many new species have been described or partly investigated, in several instances necessitating a revision of the genus or section of the genus concerned. In particular, detailed studies have been made in the genera *Andropogon*, *Eragrostis*, *Loudetia*, *Tristachya*, *Urelytrum*, and several smaller genera.

Numerous queries from correspondents and visitors to the Herbarium have been dealt with, involving the nomenclature of genera and species, investigation of new species, reference to the literature on the morphology and anatomy of grasses, economic applications, and sources of supply of seeds or plants required for various purposes (cytological research, soil-binding, pasture plants, lawn-grasses, etc.).

Lists of the grasses of the Gold Coast and Anglo-Egyptian Sudan have been revised and the nomenclature brought up-to-date, whilst several papers dealing with various aspects of the study of the Gramineae have been checked for their authors (Grasses of Barbados, Cytology of African grasses, etc.).

Instruction on the classification and methods of identification of grasses have been given to botanists and agricultural officers proceeding to Borneo, Nyasaland, Tanganyika, and Uganda.

Research in the *Cyperaceae* has been mainly concentrated on a revision of Malaysian *Carex*, now on the eve of publication, involving this year the examination of 1570 sheets from the Herbarium of Buitenzorg and 588 sheets from Leiden.

The genus *Uncinia*, and the remarkable *Schoenoxiphium kobresioideum* Kukenth., in Malaysia, have been investigated, as part of the preparation of the *Cariceae* for the Flora Malesiana.

A new genus of the *Scirpeae* was published.

Vascular Cryptogams. Much time has been devoted to determination of living plants grown in the Gardens and material from dried collections from various countries. Research has been concentrated on African, and especially Tropical East African, genera.

Algae. Various collections have been determined and the material laid in. Research has been mainly on specimens from the Gold Coast.

Fungi. Routine work during the year has included considerable help with identification given to other workers either conducting surveys or investigating special groups. In this way the Herbarium has been enriched by the acquisition of many unusual species, as recently, for instance, by various hypogeal fungi which are very rarely collected. Assistance has also been given to other mycologists and lichenologists by means of loans of type material.

The assistant mycologist has continued his work on the inoperculate *Discomycetes*, but this was interrupted when he left in early September to spend about four months collecting Agarics in Trinidad. The senior mycologist has continued her investigations on the lower *Basidiomycetes*, and completed and sent to press an account of the Rust Fungi of Uganda.

Mr. P. K. C. Austwick, holding a Research Studentship from the Agricultural Research Council, started work in October on the anatomy of British *Polyporaceae*.

Fumigation Chamber. This was used on twenty-two occasions. Mounted material fumigated included the genus *Rhododendron* (all material), *Sorghum*, *Berberis*, *Nymphaea*, *Papaver*, African *Capparis*, and several genera of *Compositae*. The Herbarium was fumigated with D.D.T. smoke during the summer with the object of killing all adult flying beetles.

Experimental Ground. A considerable rearrangement of the beds has been undertaken particularly with a view to providing for the species collection of *Dianthus*, now comprising some fifty stocks which is specially financed by a grant from the Ministry. Specimens of a large number of species were collected for the herbarium in both flowering and fruiting condition, and studies of *Viola*, *Silene*, *Cerastium*, *Vicia*, *Dipsacus*, and *Centaurea* have been continued by various members of the staff.

Spirit Collection. Many hundred bottles were added to this during the year, particularly from Africa, where the collections are now reaching the useful stage of representation. Especially valuable collections of species of *Utricularia* were received from various sources.

Collection of portraits. The collection of portraits of botanists, hitherto mounted on large cards and contained in large portfolios, has now been transferred to filing cabinets. All those portraits which do not exceed 10″ × 8″ have been transferred to special stiffened envelopes which are arranged vertically in alphabetical order of names. The few portraits which exceed 10″ × 8″ in size remain in the original portfolios.

Index Kewensis. The compilation of the next supplement (1941–50 inclusive) has proceeded slowly owing to reduction and change in staff. The independent works received at Kew have been examined and good headway has been made with the periodicals. Little work has so far been done at the British Museum (Nat. Hist.). The amount of literature from which extraction has to be made has greatly increased in recent years, but the number of new names found is relatively far less than formerly. The number of entries in the new supplement, including genus cards, is estimated as roughly 30,000.

Botanical Magazine. Volume **166** (N.S. tt. 45 to 88), edited at Kew for the Royal Horticultural Society, was published in four parts. Reproduction of the coloured plates was by a photogravure method and the standard of the text has been maintained, if not enhanced. Of the 44 articles, 41 have been contributed by members of the Kew staff. Many of them have involved considerable original investigations. The Royal Horticultural Society has presented the originals of the plates and text figures to the Kew Herbarium.

Students' Exhibits. On the 6th and 7th May 1949, special exhibits were arranged for students in the three wings of the Herbarium. Members of the staff cooperated in preparing series of specimens (living and dried), maps, diagrams, books, etc., in illustration of the research work carried out at Kew. About 300 students and teachers visited the exhibition during the two days.

The Library

With the provision of a special grant for the purpose, progress has been made in binding arrears which accumulated during the war years and many volumes needing attention have been bound or rebound.

Numerous enquiries of a bibliographical and biographical nature have been dealt with by the Library staff during the year. Our entries for the new edition of the World List of Scientific Periodicals have been revised and a list of new periodicals taken at Kew since the publication of the last edition has been sent to the editors.

As in former years books and other publications have been lent to other Government Departments and Agricultural Bureaux. Loans to workers on *Diatomaceae* have been continued from the Bentham-Moxon collection of books on this group of plants.

Many additions to the Library have been received either as purchases, exchanges, or presentations during 1949. A number of publications have been sent from their publishers for review while a number of books have been generously presented by the authors, by members of the staff, and others. Our collection of reprints has been enriched by copies of many botanical papers kindly sent by the authors.

We are again indebted to the Royal Horticultural Society, the Empire Cotton Growing Corporation, the New York Botanical Garden, the Carnegie Institution of Washington, the Commonwealth Agricultural Bureaux, Departments of Botany, Agriculture, and Forestry, Societies and Institutions both at home and abroad for publications received during the year.

The Ordnance Survey and the War Office have kindly continued to send us maps, thus making valuable contributions to our collections.

The Museums

A total of over a thousand enquiries have been dealt with by the Department during the year. These have covered a wide range of economic plants and plant products.

A notable feature has been the number of enquiries relating to tanning materials. Difficulties over supplies of quebracho from the Argentine and currency questions have stimulated interest in other vegetable tanning materials. One of the less known uses of tanning materials is in oil drilling, to reduce the viscosity of the drill mud without reducing the specific gravity. Quebracho extract has been much used in this connection. Information on other vegetable tanning materials has been supplied to a well known oil firm interested in this subject.

A number of the enquiries received have been on fibres, particularly on jute substitute fibres and on " green " and " white " Ramie. The fibre of *Clappertonia ficifolia* Decne (syn. *Honckenya ficifolia* Willd.) which is a common plant in many parts of West Africa is attracting attention in some quarters with a view to possible development commercially. The plant is of rapid growth, given the right conditions and is capable of yielding high quality fibre.

Other enquiries dealt with have included :—advice to an engineering firm contemplating producing a new type of tea dryer and requiring leaves of a kind suitable for trial purposes and available in quantity locally : identification of carbonized and fossilized seeds and fruits from a neolithic village site in the Sudan : identification of " sacapira " beans from Brazil (*Pterodon* sp.) said to be efficacious in fever : information on " Tonkin cane " (*Arundinaria amabilis* McClure) and its occurrence and exploitation in southern China : information on the genus *Eugenia* with a view to selecting species closely allied to the Clove tree likely to be suitable for grafting in connection with the work now in progress on disease control with this crop : information on Indian Artemisias known to be rich in santonin : the cultivation of Indian Khus root (*Saussurea lappa* Clarke) : the use of " tropical kudzu " (*Pueraria phaseoloides* Bth.), and the cultivation of angelica and of *Ammi visnaga* in Commonwealth countries : the identification of nut kernels said to have been used in South Africa in confectionery and to have caused vomitting (*Ricinodendron*, probably *R. rautanenii* Schinz).

Interest in medicinal plants continued and information on the cultivation of purgative drugs, mints and other *materia medica* has been supplied to correspondents in South Africa, Australia and other parts of the Commonwealth. Much public curiosity has been aroused in *Strophanthus sarmentosus* A.P.DC. as a source of cortisone, and a number of samples of seeds of *Strophanthus* and other Apocynaceae and Asclepiadaceae have been received for identification. One consignment offered for sale consisted of seeds of a *Holarrhena* sp., and a description of these with a warning against accepting without close scrutiny any seeds purporting to be *S. sarmentosus* was published in the pharmaceutical press.

The unusually prolonged drought had its repercussions on the work of the Museums. When the limes, *Tilia* spp., came into bloom in June their blossoms were soon dried up and the usual nectar flow was cut short. At the same time, conditions favourable to the development of aphids resulted in a heavy deposition of honey-dew on the leaves of limes and other trees. Public interest was aroused in the nature of this sticky excretion and the reason for the blackening of pavements below lime trees. At the end of July when beekeepers were extracting their honey, enquiries as to the cause of dark or nearly black honeys were received. Honeys examined microscopically gave evidence of the presence of honeydew, but it was found that the dark colour of samples from the London area was due mainly to the presence of soot particles and only to a very minor extent to the spores of sooty moulds. Although such honeys are inferior in flavour and colour, they nevertheless appear to be quite wholesome.

Later in the season the effects of the drought were manifested in enquiries concerning subsidences in buildings resulting in cracked walls.

In several instances, poplars and other large trees planted too near to buildings were responsible by causing a shrinkage of clay soils under parts of the buildings adjacent to the trees. An increase in the number of animals poisoned, or suspected of having been poisoned, by browsing on shrubs may be attributed to shortage of green fodder caused by the drought. The yew, *Taxus baccata* L., was responsible for some deaths and circumstantial evidence pointed to the snowberry, *Symphoricarpus albus* Blake, as the cause of another. Evidence of poisoning by the snowberry is inadequate and it is being investigated further.

A constant stream of specimens of conifers and other hardy trees and shrubs was received for identification. During the year, the greater part of the living collections of conifers at Bedgebury has been examined and corrections made in the identifications where necessary. Material of forms not represented in the Arboretum Herbarium was gathered and added to the collection.

A large number of specimens showing interesting examples of fasciation were received during the summer months from various parts of the British Isles. It is probable that the unusual summer conditions favoured the development of fasciated tissue in many species. A special exhibit of interesting examples of fasciation was arranged in one of the museums.

Special exhibits were also arranged in June and July in connection with " Colonial Month " organised by the Colonial Office. This included an exhibit of floras and other botanical works on the Crown Colonies which have been prepared at Kew.

Among the specimens of special interest donated during the year were the following—wood of *Ulmus plotii* Druce from the type tree at Banbury, Oxfordshire, blown down in a gale about 1943 : a portion of the trunk of the Chilean species *Azara microphylla* Hook. f. from a tree of apparently exceptional size for one grown in this country. (The latter was received from Sir Stephen Middleton, Belsey Castle, Newcastle-upon-Tyne, who stated that his grounds contained a number of unusually large specimens of many of the less common trees and shrubs). A fine Wedgewood plaque of Sir William Hooker, presented by his great grandson, Lt. Col. E. E. P. Hooker of Penpont, Brecon, has been placed (temporarily) in No. 1 Museum.

A study of certain aspects of the early history of Kew has been undertaken by one member of the staff in co-operation with an historian who has paid several visits to Kew and also carried out research in Continental countries. Certain interesting points which do not appear to have been recorded hitherto have been brought to light. It is expected an account of these will be published jointly in the near future.

A rearrangement of the cases has been effected in No. 3 Museum, and many of the specimens may now be seen to better advantage. A good deal of relabelling has also been done in this Museum.

In No. 1 Museum the installation of a new boiler, necessitating the rebuilding of the boiler house, has resulted in greatly improved heating throughout the building, including the top floor, where previously the heating was very inadequate in cold weather.

Staff

Mr. S. G. Harrison, B.Sc., formerly an Indian Army Officer and at one time in the Andamans, was appointed temporary scientific Officer in the Museum Department on the 22nd August, having had his degree course at Leeds University interrupted by the war.

Jodrell Laboratory

Larger windows have been put in the main room on the north side of the building to provide better light for microscopical and dissecting work. Much needed improvements in the heating facilities in the same room have also been provided by H.M. Ministry of Works. These alterations have made it possible for the Keeper to occupy the main north room, where interviews and discussions with visitors can now be held in less cramped conditions than those prevailing in his former office. The Keeper's former room is now used to house the reference collection of microscope slides, and is also available for the use of visiting botanists. The whole building has been completely redecorated both inside and out, an operation that had been postponed for a very long time on account of the war.

Rather more than eighty timber samples have been examined microscopically and identified during the year. Many of these were unfamiliar types that seldom occur in commerce, and, in consequence, their identification was frequently rather difficult. A few samples could not be identified at all owing to their not being represented in our reference collection.

About ninety-three samples of charcoals from archaeological excavations have also been identified at the request of archaeological experts. This material, much of which was very difficult to deal with, was excavated in various countries including Great Britain, France and Cyrenaica.

Numerous other miscellaneous samples have been examined with a view to establishing their botanical identity. These included material from the stomach of a valuable pony which had died unexpectedly. The stomach contents were shown to consist largely of the stems and leaves of *Robinia pseudacacia* which are known to be toxic to horses. Several samples of roots that were undermining the foundations of buildings, or filling drains, were also identified, chiefly at the request of architects.

Considerable time was devoted to correcting the proofs of the reference book entitled " Anatomy of the Dicotyledons ". In their final form the two volumes of this book will consist of exactly 1500 pages, together with an Introduction of 64 pages. Page proofs of the entire work, including the Bibliography and Index, have been corrected, and revised page proofs of about 1400 pages have also been dealt with. Proof reading has been slower and more exacting than was at one time anticipated, but the continued close collaboration of Dr. Chalk of the Imperial Forestry Institute, Oxford, and considerable assistance from Miss E. M. Slatter have enabled the work to proceed steadily throughout the year. Mr. E. Nelmes completed the index under the supervision of the authors, and also assisted to correct the proofs of this part of the book. In the opinion of the authorities at the Clarendon Press the printing of the book will have been completed by the end of January 1950. In collaboration with the publishers, arrangements have been made for reviewing and advertising the book.

Miss E. M. Slatter completed the preparation of a card index to the literature dealing with the anatomy of the Monocotyledons, on which it is proposed to write a book which will be a sequel to " Anatomy of the Dicotyledons ". Considerable correspondence concerning the sequel has been conducted with Dr. F. J. Meyer of Brunswick, who was engaged in preparing a German book of reference on similar lines. In view of the work now being undertaken at Kew, and because of the economic difficulties by which his publishers are confronted, Dr. Meyer has now decided not to continue with his work and has offered to assist with the book to be prepared at Kew.

The Keeper made a special investigation of the anatomy of the *Dioncophyllaceae*, and has written an account of these researches for publication. The article is intended to accompany one on the taxonomy of the family by Mr. H. K. Airy-Shaw. The Keeper also examined, and has drawn up a description of, the anatomy of a newly discovered plant of great taxonomic interest, collected in the Cameroons by Mr. J. P. M. Brenan.

Mr. F. Richardson has continued to make microscope slides of representatives of the Monocotyledons and of numerous timbers, all of which have been incorporated in the reference collection. His increasing ability to assist in identifying the numerous samples received at the laboratory has enabled the Keeper to devote more time to research than would otherwise have been possible. Mr. Richardson has also experimented with the use of polyvinyl alcohol as a mounting medium for microscope slides, and, in collaboration with the Keeper, has prepared an account of these investigations for publication.

We are greatly indebted to Dr. Chalk, of the Imperial Forestry Institute, Oxford, for the loan of a set of punched index cards on which data (mostly original) are recorded whereby the timbers of some 4,000 species can be identified. This enabled Miss E. M. Slatter to prepare a duplicate set of the cards which will serve as the nucleus of a collection of our own. The cards have already proved useful in facilitating the identification of unfamiliar timbers.

Miss Slatter continued her work on raising irises from excised embryos cultivated on nutrient agar under aseptic conditions. An account of this work is now ready for publication.

The British Pharmaceutical Codex 1949 was published towards the end of the year. In it acknowledgment is made of assistance in the preparation and revision of monographs on vegetable drugs given by the Keeper whilst serving on the pharmacognosy sub-committee for more than ten years.

Professor I. Manton and Dr. E. K. Janaki Amal have made use of the laboratory from time to time when fixing material for cytological examination. Dr. T. E. Wallis, Dr. Fairbairn, and a few of their colleagues and students at the Pharmaceutical Society have visited the laboratory periodically for consultations concerning the microscopical structure of vegetable drugs.

The Gardens

The year 1949 was exceptional because of the record amount of sunshine during the summer months and this, combined with long periods of drought, made the maintenance of the collections out of doors a very difficult task. The total rainfall for the year was about 22 1/2 ins. but as over 10 ins. of this fell in the last three months of the year, the shortage throughout the rest of the season can readily be appreciated. Several young trees transplanted two seasons ago were scorched by the sun and never recovered, and there were many fatalities among the older trees.

Once again requests for plant identifications and for technical advice in connection with plant maintenance were very numerous, and close on six thousand items of this kind were dealt with by the Curator's office staff during the year.

Arboretum

Serious losses continue amongst the older trees, and more particularly amongst the Beeches. Eleven large specimens have had to be removed because of their dangerous condition, these comprising seven Beech, one Sweet Chestnut, one large Cedar and two Pines. In addition, a number of Elms have also had to be removed because of attack by Dutch Elm Disease. In autumn a very large Lime tree near Brentford Gate was blown down and in falling badly damaged a number of young birches which subsequently had to be removed.

The prolonged drought during the summer months was responsible for a large number of branches being shed from trees, particularly from Beeches. In order to obviate danger to the general public seats had to be moved away from large specimen trees into the open. As yet it is too early to assess the effects of the exceptionally dry season on both trees and shrubs. A large number of trees were defoliated by early September, whilst the foliage on other trees has remained until December. It was anticipated that the display of autumn colour would be well above the average but this was not so, and only a few, notably the Japanese Cherries, were above normal.

The display of flowering trees and shrubs was again good, though the dry atmosphere tended to cut short the period of blossoming and did not favour the later flowering shrubs. In early spring, Rhododendrons, Magnolias, Malus and Prunus flowered freely and if anything the Japanese Cherries were better than usual. During the season several rare species flowered including *Paulownia tomentosa*, *Cladrastis sinensis*, *Rhododendron macrocarpum* and *Elliottia racemosa.* It was anticipated that seed crops would be well above the average and though this proved to be so with most genera, there was a definite shortage of fruits on many of the Rosaceae, including Crataegus, Malus and Cotoneaster.

The chief constructional operation carried out during the year was the building of a Clematis wall and mound near to the Berberis Dell. A certain amount of contouring, which necessitated the use of a bulldozer was first carried out, after which some 120 tons of limestone rock were used in building the wall. The dry weather in February and March facilitated operations, and many of the old specimens of Clematis were successfully transplanted in new positions. It is anticipated that by the spring of 1950 the whole of the Clematis collection, with a few exceptions, will have been planted on this site, thus doing away with the unsightly and unsatisfactory pole supports that were formerly used.

The general overhaul of the Bamboo Garden which was carried out during the spring enabled the species of *Arundinaria*, *Phyllostachys* and *Bambusa*, obtained from the United States Department of Agriculture during 1947, to be added to the collection. The Vitis and Ampelopsis collection on the pergola surrounding the Tea Pavilion also received attention and the nomenclature was checked and corrected where necessary. The display of fruit on a number of the vines has been exceptionally good and *Vitis brevipedunculata* var. *Maximowiczii* with its pale blue fruits was outstanding. Opportunity was also taken to replant the Cytisus collection, where a number of species had become badly overgrown. Several of the beds were replanted with young stock specially raised for this purpose.

A number of young *Metasequoia glyptostroboides* have been planted out in selected positions and in spite of the dry season have made satisfactory growth. The two trees planted out in September 1948 in the nursery have grown rapidly and are now over 5 ft. high and appear perfectly hardy. Further consignments of seed received from the Arnold Arboretum were sown, and 100 seedlings have been sent to Bedgebury Pinetum for trial there. Plants raised from cuttings in September have also grown freely and cannot be distinguished from seedling plants by their growth characters. Specimens of this species have been distributed to a number of selected gardens to test its reaction to various soils and climatic conditions.

The area of land devoted to vegetables was this year reduced, and a portion which has been under vegetables for some ten years was resown with grass seed and an excellent sward obtained. Experiments have been carried out with the use of coffee residue for mulching purposes and in the majority of tests the results have been beneficial.

A number of new introductions and additions were received during the year and noteworthy among them were *Nothofagus betuloides*, *Stuartia ovata*, *Ehretia microphylla*, *Magnolia glauca*, *Populus vancouverensis*, *Fraxinus Raywoodii* and *Liquidambar fosterii*. A large consignment of seeds collected by Kingdon Ward was received from the New York Botanic Garden and also one from the British Museum of various seeds collected by Captain Sherriff and Mr. Ludlow.

Decorative Department

Without question the most noteworthy of the spring bedding was the display of Darwin Tulips on the Palm House front. The all-round uniformity and excellence of bloom well repaid the work carried out the previous autumn when many beds were resoiled. Along the Broad Walk many beds of tulips were badly effected by Fire Disease. Wallflowers usually give a poor display at Kew but owing to the very mild winter they were extremely good this year.

The hot dry summer months favoured the display of Pelargoniums, and they continued to flower from the last week in May until well into October. The introduction of tuberous Begonias in beds near the Lake created much interest amongst the visitors, and these beds were possibly the most colourful of all in the bedding schemes. The bedding Dahlias along the Broad Walk stood up very well to the dry conditions though before the end of the summer the prolonged drought tended to reduce their flowering considerably. In the Rose Garden the flowering was the worst for many years and some of the older beds suffered so drastically from the hot dry atmospheric conditions that much replenishment will be necessary.

Various structural alterations were carried out in the glasshouses in the department, the most important being the erection of new concrete centre and side stages in House 21. The installation of a new concrete sill in House 19 greatly facilitated the ventilation of the house as previous to this the side ventilators could not be opened. In the Conservatory seasonal displays have been well maintained and decorative plants such as Cyclamen, Primulas, Cinerarias, Calceolarias, Begonias and many others have flowered to advantage no doubt because of the additional amount of sunshine. This latter factor was probably responsible for the shortness of the flowering season of the Chrysanthemums as very few varieties continued to bloom well into December. The " Charm " type of Chrysanthemum formed a special feature in the display.

The fruit and vegetable demonstration plots were again maintained by the department and on the retirement of Miss J. Sharps, she was succeeded by Miss R. Periam who acted as demonstrator to great advantage. During the year, owing to disease, the old stocks of Red and Black Currants were discarded and new stocks of these, as well as Gooseberries and Strawberries were introduced in early spring.

Tropical Department—Palm House

A considerable amount of work has been done amongst the Cycad collection and also amongst the Palms, where many of the large specimens which had become overgrown were retubbed during the year. Female cones were produced on *Cycas circinalis*, and these, when fully mature, will be sent to scientific institutions. Interior repainting necessitated a considerable upheaval at the southern end of the house and despite the use of tubular scaffolding a certain amount of damage was done to plant material.

T. Range

During the year a great number of interesting Orchids were added to the collections, many species not having been represented in the collections before. The condition of the plants continues to improve and to justify the policy of always having permanent men in charge of the collections. In the narrow borders outside the orchid House and facing due south, the bulbous plants such as *Nerine Bowdenii*, *Amaryllis Belladonna* and *Amaryllis Belladonna* var. " Hathor " flowered profusely. Flowering material of the latter plant was shown at the Royal Horticultural Society's Show on September 6th 1949 and received a First Class Certificate. The *Victoria Regia* this year grew remarkably well and benefited from the provision of wire screens to both north and south sides of the tank, which gave added protection to the leaves and also reduced considerably the losses in goldfish.

Ferneries

There is no doubt that the standard of the collections is today greatly improved due, no doubt, to the many fine additions made of recent years and to some extent to the permanency of supervision. Many plants have been received during the year particularly from New Zealand, U.S.A. and the Azores and most constitute valuable additions.

House No. 5

Interior painting which has not been carried out for many years was undertaken in the northern end of the house and the opportunity was utilised of thoroughly overhauling and rearranging the collections of Aloes, Euphorbias, Gasterias, etc. Many of the large plants were retubbed or repotted and the general appearance of this end of the house was greatly improved. Plants of interest that have flowered during the year were *Agave fourcroydes*, *A. ellemeetiana* and *A. filifera.*

Tropical Pits

A good deal of work during the year in this section dealt with economic plants, and particularly Groundnuts (Arachis species). The original seeds were received from the Overseas Food Corporation and after having been grown on, were propagated from cuttings and the resultant plants eventually sent out to Africa by air. A large consignment of seed of Arachis species from Brazil was sown, and the plants will probably be ready for despatch in early spring of 1950. Special stocks of *Hevea brasiliensis* received from Malaya have been grown on from seed, and it is hoped next season to be able to bud these with high yielding varieties. Early in the year Musa stools were received from Amani, Dar-es-Salaam, Hong Kong and Zanzibar and many young plants have been propagated from this stock. These are at the present time being grown on ready for despatch next year to the Imperial College of Tropical Agriculture, Trinidad.

The boilers in the large stoke-hole in the Melon Yard were dismantled, overhauled and reassembled, and in order to improve the draught on the boilers, a complete new back flue was introduced and a new chimney-stack built. During this operation it was found necessary to renew the 6 in. main which runs from the boiler house through the tropical potting shed.

Temperate Department

During the course of the year every effort has been made to increase and to keep in good condition the large and representative collection of tress and shrubs which have been obtained from the north and south temperate zones of the world. The main collections are those from Australia, South Africa, New Zealand, Temperate North and South America, Northern India and such-like places, and these plants generally thrive in a temperature just free from frost and rising to 70–80°F. during the summer period. There is a great variation in soil requirements for these plants, and because of this considerable knowledge and experience is necessary to grow them successfully.

In the war period considerable damage was done to the whole of the Temperate House structure and despite large sums of money spent on re-glazing and re-painting, the whole building leaks badly every time there is rain. The constant drip from the roof continues to cause serious losses, especially in the South African and Australian collections, and this will continue until this structural defect is remedied. Many plants raised from seed sent over from Australia in 1941, 1942 and 1943 and which had attained a height of 5 and 6 ft, have been lost because of this excess moisture both at the root and in the air.

The painting of the Temperate House, which had commenced in the autumn of 1948 was completed towards the end of the year. The inevitable damage which accompanies such an operation was, despite the use of tubular scaffolding, widespread and serious. Pots of paint were dropped into the crowns of palms and, on one occasion, one of the painters' mates was discovered wiping paint off a plant by means of a rag dipped in kerosine oil.

In early spring there was a fine display of flowering shrubs which had been forced and such plants as Forsythias, Deutzias, Azaleas, various Prunus and special and hybrids of Malus, made a long and lasting display. The Acacias flowered freely from January until May and the large specimen plants of Luculia pinceana and L. gratissima flowered even more freely than usual. The scent from these two trees is a great delight in late winter.

The Java Rhododendrons planted out in the border in the south section of the Temperate House have picked up remarkably well in recent years. They are very fastidious and difficult plants to grow, and the Kew collection, many of which have now attained a height of 7 or 8 ft., can be regarded as the best in Great Britain.

Another feature of the display in the Temperate House is the fine collection of Camellias which have been collected together from all parts of the world. The original plant of *Camellia reticulata* which is now about one hundred years old is still in good health and flowers profusely each spring, whilst many of the forms of *Camellia sasanqua* are worthy of much more attention than they have yet received. The tea plant, *Camellia theifera* and a closely allied and new species, *C. taliensis*, both flowered freely during late autumn, whilst the rose coloured *Camellia saluenensis* continues to flower in both November and December.

Alpine and Herbaceous Department

The very hot dry summer period proved too much for many of the moisture loving plants and several of the Primulas and Meconopsis failed to survive the dry conditions, despite continual watering which was carried out on most days in the Rock Garden. Some plants, of course, appreciated these conditions, and because of them flowered much more profusely than they normally do. Many of the annuals and biennials behaved in this way, though the flowering period of most of these plants was very much shortened.

In the Rock Garden the reconstruction of that section devoted to sandstone formation, was continued and possibly another winter's work will be necessary before this revision is complete. The Sussex sandstone, which is purchased from West Hoathly, weathers remarkably quickly and consequently operations of this kind are carried on without a great deal of disfigurement. At the southern end of the garden many of the soil pockets in the limestone area were taken out and resoiled. The opportunity was taken, at the same time, of rebuilding several small sections, though this work cannot be completed properly before the sandstone section is dealt with.

In the Iris Garden the majority of the beds were replanted and here and there certain varieties were moved with the object of improving the colour scheme.

For some years now it has been very difficult to carry out the whole of the propagation necessary in the very confined space available within the Alpine Yard. To increase the amount of room available, some of the old frames which were beyond repair have been discarded and several new wooden span frames of a new design were erected in their place. Alterations to further frames and greenhouses are contemplated, and some two or three years may elapse before the desired standard of efficiency is attained.

Amongst the many interesting collections of seeds and plants received by the department during the year were the following :—A collection of Narcissus species, natives of Gibraltar, were received from Mr. G. Roberts; a collection of seeds, native of Morocco, from Monsieur J. Gattefosse ; a collection of hardy North American grasses from Dr. Dare of Ottawa ; a large collection of seeds from Spain collected by Messrs. Heywood and Davis ; a collection of seeds from Turkey sent in by Mr. P. H. Davis ; from the British Museum two collections of seeds, one of seeds collected by Mr. Polunin in Nepal and the other consisted of bulbs and other tuberous rooted plants collected by Messrs. Ludlow and Sherriff. In addition to these outstanding collections, valuable help was received in the gift of both plants and seeds from the Botanic Gardens of Cambridge, Glasnevin, Oxford and Edinburgh and from many other such centres in different parts of the world.

During the year some 5,984 packets of seed were sent out to other establishments, making a grand total, with the Arboretum department, of 13,178, which represents an increase of well over 3,000 packets on previous figures.

In addition to the collections already referred to, some 690 contributions of plants, bulbs, seeds, etc., were received by exchange. It is of course obvious that owing to the magnitude of the Kew collections, we have far more to offer which other scientific institutions do not possess than they have to offer us, but for this very reason the material we receive though less in quantity, often consists of species which are rare or difficult to obtain.

Economic Botanist

Sir Geoffrey Evans continued to act as Economic Botanist on a part-time basis. Mention was made in last year's report of the renewed interest that is being shown by different colonies in the interchange and import of certain tropical plants of economic importance.

Research stations for certain crops of export value, have now been established in different colonies, each of which is engaged on plant breeding work, with a view to the introduction of higher yielding, better quality and disease resisting varieties. This particularly applies to caçao since the main producing areas in West Africa and the West Indies are now menaced by virus diseases in the former, and by Witches' Broom in the Caribbean.

To meet the situation, it is intended to develop cocoa production in other parts of the world where conditions appear to be suitable and the best planting material avaulable from the Research Stations in Trinidad and the Gold Coast will be utilised to start these new plantations. Attempts are also being made to improve rubber and banana production by similar means.

The chief danger is the spread of disease from one region to another, and to avoid this Kew has been asked to supervise an intermediate quarantine station where introductions can be grown under observation before transfer to their ultimate destination. During the year meetings were held with Colonial Officials and others interested in the project, and it has now been decided to erect a plant quarantine greenhouse in the Melon Yard, as soon as possible. The necessary funds have been provided from the Colonial Development and Welfare Organisation for capital and recurring expenditure and it is hoped that work on construction will proceed without delay. This house will be used in the first place for cocoa introduction, but other plants may also be grown such as rubber, bananas and others as occasion demands.

Sir Geoffrey continued as Chairman of the National Pinetum (Bedgebury) Committee and considerable progress was made during the year in bringing up to date the planting programme, which had been in abeyance, during the war, in overhauling the labelling and in laying down a definite programme for the future.

He continued to serve as a member of the Colonial Advisory Council for Agriculture, Forestry and Animal Health, and also on the other committees mentioned in last year's report. In addition he was asked to become a member of the Colonial Forestry Commission and in view of the decision to develop the forest resource of British Guiana on the lines indicated in the Report of the British Guiana and British Honduras Settlement Commission, of which he had been Chairman, he accepted.

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A NEW RUST FROM AUSTRALIA.

R. W. G. DENNIS.

Puccinia calogynes *Dennis*, sp. nov., aecidiis amphigenis, sparsis vel aggregatis, 250 μ diam., cupulatis, albidis, margine recurvato, inciso ; cellulis peridii firme conjunctis, rhomboideis, 25–30×10–15 μ, pariete exteriore striato, 3–4 μ crasso ; aecidiosporis polygonis vel subglobosis, subtiliter verruculosis, dilute aurantiacis, 12–13×10–12 μ. Soris teleutosporiferis amphigenis vel caulicolis, sparsis saepius circa æcidia sitis, minutis, rotundatis vel elongatis, atris ; teleutosporis clavatis vel oblongo-clavatis, apice rotundatis vel acutiusculis, incrassatis usque 6 μ, medio plus minusve constrictis, basi attenuatis, lavibus, brunneis, 35–46×17–20 μ, pedicello hyalino, persistente. Hab. in foliis vivis et in caulibus *Calogynes berardianae*, Australiae Occid. Typus : Wongan Hills, *A. Morrison* 13207, 7. x 1903.

From most species of *Puccinia* previously described on Goodeniaceae *P. calogynes* differs in its smaller teleuto and æcidiospores. From *P. gilgiana* P. Henn. it differs in the host genus and in the apparent absence of uredospores. These differences are brought out in the following table.

Species	*Teleutospores*	*Aecidiospores*	*Uredosori*	*Host genus*
P. dampierae Syd.	48–66×16–26 μ	15–19×13–14 μ	Absent	*Dampiera*
P. brunnoniae McAlp.	45–60× 9–10 μ	17–21×15–16 μ	Absent	*Brunonia*
P. saccardoi Ludw.	40–66×17–25 μ	14–17×13–14 μ	Absent	*Goodenia & Velleia*
P. gilgiana * P. Henn.	30–45×16–22 μ	15–20 μ	Present	*Leschenaultia*
P. calogynes	35–46×17–20 μ	12–13×10–12 μ	Absent	*Calogyne*

CLASSIFICATION OF THE BANANAS.

By E. E. CHEESMAN.

Imperial College of Tropical Agriculture, Trinidad, B.W.I.

III. Critical Notes on Species.

o. Musa lolodensis *Cheesman* sp. nov.—*Planta alta, stolonifera, foliis utrinque viridis, inflorescentia pendula, bracteis fusco-luteis nitentibus convolutis multifloris, floribus aurantiacis, fructibus in maturitate dehiscentibus, seminibus rotundatis angulatis depressis.*

This very interesting species was received as seed in July 1940 from Dr. David Fairchild, who has also kindly furnished me with notes on the original collection. The seed had been collected in June by Dr. Fairchild and Mr. Hugh M. Curran in North Halmaheira, N.E.I. and the collection is Fairchild Tropical Garden Expedition Accession No. 388.

The plant has the stature and general habit common among edible bananas, with the rather shining green leaves and pseudostem of *M. textilis.* It is quite distinct from that species by its brownish-yellow convolute bracts, the colour of its flowers, and its entirely different fruit. It has, however, 10 pairs of chromosomes (K. S. Dodds, unpublished) and on that fact and the shape of its seeds is referable to the same section as *M. textilis*, viz. §*Australimusa.*

The species presents several features of interest. In its female flowers it has organs which from their position must be regarded as staminodes, but which end in sticky knobs exactly like reduced stigmas. The ripe fruit dehisces, and that is a habit known to me elsewhere in *Musa* only in *M. velutina* Wendl. & Drude, a species of the section *Rhodochlamys* far removed in other characters from *M. lolodensis.* The pulp surrounding the seeds is a deep yellow colour as in *M. fehi* Bert. ex Vieill. with which species *M. lolodensis* agrees in chromosome number and probably has fairly close affinities.

Individual plants of the half-dozen growing in our plots show some small differences. A noteworthy one is that on some individuals the peduncle and rachis are glabrous whilst on others they are distinctly pubescent. As pubescence of the peduncle has sometimes been considered a useful character in identification of species, it is rather important to observe that in this species at least it is not diagnostic.

A fuller description in English is :

Plant stooling freely ; pseudostems up to 4 metres or more in height, 20 cm. in diameter at base, upper parts of leaf sheaths rather bright green, shiny, devoid of wax, developing brown-black blotches varying with age and exposure. Leaf blades up to 3 m. long, 60 cm. wide, truncate at apex, unequally rounded at base, one side of the lamina a little shorter than the other, lightly glaucous beneath ; midribs paler than the lamina ; petioles 30–50 cm. long, scarcely margined above but strongly concave, their edges nearly meeting over the adaxial channel, margined towards the base, the margins closely appressed to the pseudostem and not becoming scarious.

Inflorescence pendulous in well grown examples, or at least semi-pendulous, its peduncle and rachis either glabrous or pubescent ; sterile bract about 60 cm. long, its upper quarter leaflike ; first fertile bract 45 cm. long, greenish without, dark brown within, its extreme tip leaflike ; basal flowers female, the number of female " hands " varying up to about 8, upper flowers male.

Female flowers 7–14 per bract, in two rows ; ovary 5 cm. long, bright green, glabrous, or pubescent on the pedicel only ; compound tepal 4·5 cm. long, cream, its lobes orange yellow, the lateral lobes broadly ovate, 4–5 mm. long, with a filiform dorsal appendage 2 mm. long, centre lobe narrower, also appendaged, accessory teeth 3 mm. long, of a paler yellow ; free tepal oval, 4 cm. long, 2·3 cm. wide, white, corrugate at the tip behind a 2–4 mm. apicula ; staminodes 5, varying from 1·5 cm. to 4 cm. long, the longer ones ending in viscous stigma-like knobs.

Male bud in advanced blooming broadly ovoid, the bracts convolute at the tip or only very slightly imbricate ; bracts yellow to pinkish brown outside, often with a greenish cast, quite without wax and shining with a polished appearance, inside darker, dull pinkish brown, and longitudinally striate.

Male flowers about 14 per bract in two rows, 5–6 cm. long overall ; compound tepal 4·5 cm. long, cream, its lobes orange as in the female flowers, but shorter (scarcely 2 mm. long) ; free tepal white, oblong-lanceolate, as long as the compound tepal and 1 cm. wide, its apex acute and entire ; stamens at first as long as the perianth, later exserted by at least 1 cm., the thecae dark purple, after dehiscence almost black.

Fruit bunch of about 7–8 "hands ", ripening orange-red. Individual fruit 8–10 cm. long, 3 cm. in diameter, distinctly 5-angled at maturity, narrowing rather gradually at base into a short (1–2 cm.) pedicel (which is sometimes pubescent), obtuse at apex, truncate or with a very short, broad, truncate acumen. Pericarp about 3 mm. thick, splitting at full ripeness and curling back in 3–5 irregular valves from the apex ; pulp gamboge yellow. Seeds dull black, irregularly angular, minutely striate but scarcely rough, dorsiventrally flattened, 6 mm. across and 3 mm. high.

Habitat. On banks of the river called on the charts Loloda River, but known to the natives as Soasio River, North Halmaheira, Netherlands East Indies. Described from plants in cultivation at the Imperial College of Tropical Agriculture, Trinidad, B.W.I.

CLASSIFICATION OF THE BANANAS.

III. Critical Notes on Species.

p. Musa maclayi *F. v. Muell. ex Miklouho-Maclay in Proc. Linn. Soc. New South Wales* 10 : 348 (1885).

This imperfectly known species is not in the I.C.T.A. collection, but a brief note on it is included here because it is often overlooked in lists of *Musa* species and has been missed by *Index Kewensis*.

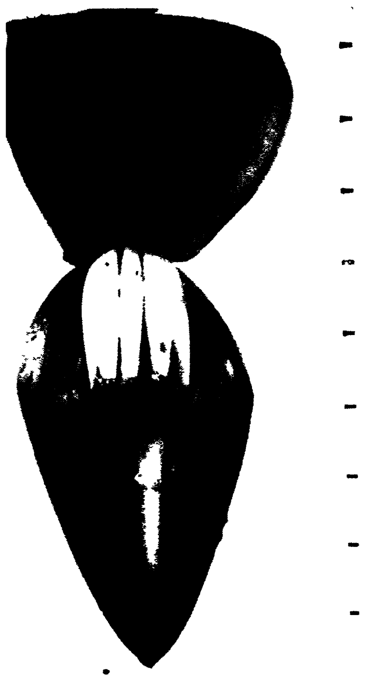


Fig. 1.

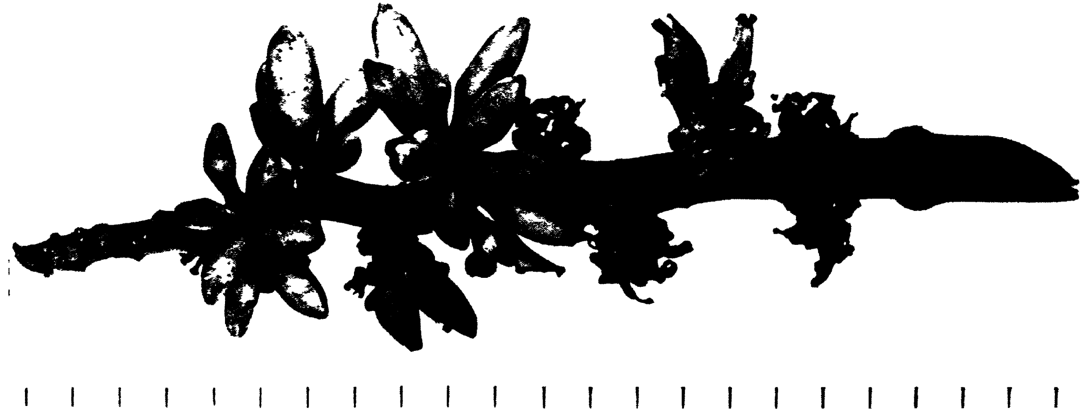


Fig. 2.

M. lolodensis sp. nov.

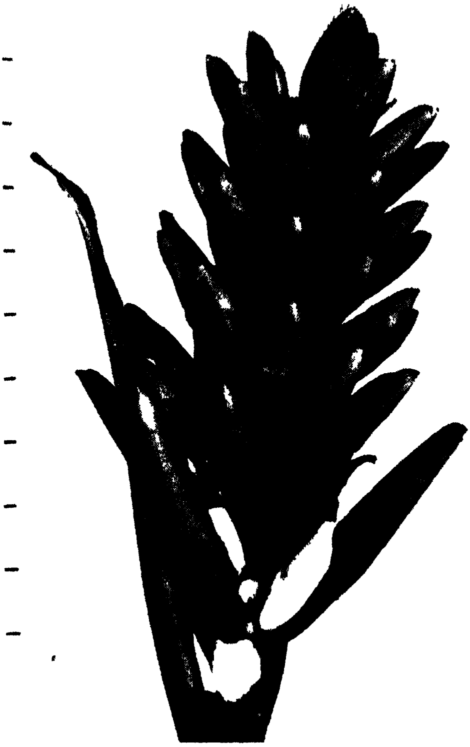
Fig. 1 Male bud in advanced blooming

Fig. 2. Fruit bunch at maturity, the upper fruits dehiscing or fallen

Scales in inches

Photographs by K. S. Dodds

PLATE 2



M. coccinea Andr.

FIG. 1. Complete inflorescence at maturity of the fruit which is visible in the axils of the lower bracts.

Scale in inches.

Photograph by K. S. Dodd.

The name occurs in a " List of plants in use by the natives of the Maclay-coast, New Guinea " by N. de Miklouho-Maclay in the Proceedings of the Linnean Society of New South Wales, Vol. 10, pp. 346–358. All that appears on p. 348 is : " Besides the cultivated varieties, which have been obtained by exchange between the villages, there is to be found in the forest a *wild* Banana (Musa Maclayi, F. v.M.), compared to the cultivated varieties, with a tall stem (nearly twice as tall), with narrow stiff leaves and small (not edible) fruits full of seeds ".

On p. 355 there commences an appendix by Baron Ferdinand von Mueller as follows : " From notes and drawings furnished by my distinguished friend, I am able to add to his account of *Musa Maclayi.* It belongs to the series of species, which in *M. uranoscopos* has its longest known representative. The flower stalk is upright or but slightly curved ; bracts are red-brownish ; the flowers occur about eight together ; the lobes of the calyx measure nearly an inch in length, the fruits are about three inches long, but hardly more than one inch broad, faintly angular ; the seeds are irregular in shape and often compressed. This *Musa* occurs on swamps and along streams ".

That, so far as I can determine, is all the information available about *M. maclayi* : but it may be enough to identify the species if it is recollected on the Maclay coast. It is at least enough to leave no doubt in my mind that the name represents a distinct member of my section *Australimusa,* related to *M. peekelii* of New Ireland and to an undescribed species in our collection from Buka Island in the Kieta District of New Guinea, as well as to *M. Jehi* and the other members of the section.

CLASSIFICATION OF THE BANANAS.

III. Critical Notes on Species.

q. Musa coccinea *Andrews, Bot. Rep. t.* 47 (1797).

This is a very well known species, because its small stature and ornamental inflorescence make it suitable for cultivation in conservatories, and it has therefore become widely distributed in the botanical gardens of Europe. It has probably been introduced also, as an ornamental, to most tropical countries. In describing it Andrews (*The Botanist's Repository, vol.* 1 (1797) *t.* 47) says :

" The honour of having introduced this supremely beautiful plant, pertains to Thomas Evans Esq. of Stepney . . . . . he having received it, amongst many others, about the year 1792 from China, where, as well as in Cochin-China, Sumatra, Java, etc., it is very commonly found . . . . The Musa Coccinea grows to the height of about three, or four feet before it blows, and without question, has no rival but Strelitzia Regina in the hothouse, where its brilliancy tends in some degree to dispel the gloom of winter, for at least three months ".

Andrews also gives a detailed description which need not be reproduced here, as his accompanying plate is quite sufficient to fix the type beyond doubt, and its identity has never been questioned.

J. G. Baker (1893) gives as a synonym of *Musa coccinea* Andr., " *M. Uranoscopos* Lour. Fl. Cochinch. 645, excl. syn. Rumph." and if he is right

Uranoscopos would appear to be the correct epithet for this species, since Loureiro's *Flora Cochinchinensis* antedates Andrews's description by seven years. Loureiro's description is :

Musa Uranoscopos. Chuoi tau.

Differ. spec. Mus. *racemo* erecto : *spathis* partialibus sub-bifloris : *fructu* compresso, polyspermo.

Hab., et notae. *Caulis* 4-pedalis, pollicem crassus. *Folia* linearia, 3-pedalia, 5 pollices lata. *Racemus* erectus, *spathis* linearibus, alternis, coccineis, sub-bifloris, multis. *Bacca* coccinea, ovata, compressa, bipollicaris, polysperma, non edulis.

Musa Uranoscopos Rumph. Amb. l. 8. cap. 4. pag. 137. Quae Musa Troglodytarum Lin. sp. 3.

The reference to "Musa Uranoscopos" of Rumphius, re-named *M. Troglodytarum* by Linnaeus, is erroneous ; for those names refer to a very different plant which has been mentioned in these notes in connexion with *M. fehi* Bert. ex Vieill. But Loureiro's description fits *M. coccinea* very well, as far as it goes, and as the epithet *Uranoscopos* had not been taken up by Linnaeus it was available for a different plant.

It would be a pity if the name by which this plant has been generally known for 150 years had now to be changed to meet the rule of priority, and in the circumstances I am glad to find a reason for leaving Andrews's name unchanged. We do not know enough about the species of *Musa* in Indo-China to identify Loureiro's species with the same confidence that we have in *M. coccinea.* I have already mentioned in these notes, when describing *M. laterita,* that there is a species (or possibly more than one) in Siam and Burma that superficially resembles *M. coccinea.* The same may exist in Indo-China, and until the species of that region have been critically re-examined we should refrain from substituting a somewhat doubtful identification for a certain one.

Although the species is almost too well known to need it, I give a description of our material in the form adopted for other species in the I.C.T.A. collection, for the purpose of defining the clone that has been used in genetical experiments. It was obtained from the Royal Botanic Garden in Port of Spain in 1933.

Plant stooling freely ; pseudostems up to 1·5 metres high, 5 cm. in diameter at base, green, devoid of wax ; leaf blades up to 1 m. long, 25 cm. wide, narrowed gradually to a rounded apex, rounded at base with one side usually longer than the other, shining dark green above, paler beneath but not glaucous ; midribs green like the lamina above, paler beneath ; petioles up to 35 cm., with narrow erect margins clasping the pseudostem at base, not becoming scarious.

Inflorescence quite erect, its peduncle scarcely emerging from the sheath of the subtending leaf, the rachis glabrous ; last foliage leaf with reddish petiole ; sterile bracts usually 2, bright scarlet with green leaflike tips ; first fertile bract about 15 cm. long ; flowers of the basal bracts female, from 1 to 4 clusters or occasionally more, upper flowers male.

Female flowers 1–3 per bract ; ovary 3–4 cm. long, 1·5–2 cm. wide, dorsiventrally compressed, orange-yellow, glabrous ; compound tepal

3·5 cm. long, orange-yellow with green lobes, the lateral lobes oval-oblong about 4 mm. long with a spinelike dorsal appendage of about 2 mm., centre lobe smaller and about equal in size to the accessory teeth which are joined to it to form one 3-lobed member ; free tepal as long as the compound, dorsally thickened, opaque, and orange in colour, laterally hyaline ; staminodes short (about 1 cm.) ; style as long as the perianth with a bright orange clavate stigma.

Male bud in advanced blooming very " open ", the bracts persisting unwithered for many days, so that there are finally about 20 open at once, but only the last one or two still with flowers ; closed portion of bud ovoid, the bracts imbricate at the tip ; bracts oblong, lower ones about 7 cm. long, 3 cm. wide, very firm in texture, bright scarlet on both surfaces, not shining on the outside, with the extreme tip yellow or green.

Male flowers 2 per bract ; compound tepal 3·5–4 cm. long, bright orange with green tip and lobes, the lateral lobes 3 mm. long with a spine-like dorsal appendage of about 1 mm., the centre lobe shorter and without appendage, joined to the accessory teeth ; free tepal as long as the compound, narrow oblong, about 7 mm. wide, dorsally thick, opaque, and orange in colour, laterally hyaline, obtuse at apex ; stamens nearly as long as the perianth, but not exserted.

Fruit oblong, 4–5 cm. long, crowned by the persistent withered perianth, 2–2·5 cm. wide, somewhat compressed dorsiventrally, rounded at the sessile base, narrowed to a truncate apex ; pericarp about 1·5 mm. thick, orange-yellow at full maturity with a waxy bloom ; pulp white.

Seeds almost cylindrical, black, about 6 mm. long, a little wider at the top than at the base, with a distinct waist marking the base of the perisperm chamber within, 4 mm. in diameter at the waist, the surface marked with longitudinal warty ridges.

M. coccinea was the earliest described of the species that I group together as *Musa* § *Callimusa*. Its value as an ornamental depends mainly on the persistence of the bracts in a living condition long after the subtended flowers have faded, and as this character is rare in *Musa*, the superficial resemblance of *M. coccinea* to other members of § *Callimusa* is not very close. It belongs there, however, both by its seed shape and by its chromosome number (n = 10) ; and its genetical behaviour indicates the same relationship. The only species with which it has been successfully crossed are members of the same section. With *M. borneensis* Becc. it gives a vigorous hybrid, although that species is entirely different in size and habit.

Flora of the Albert National Park, Belgian Congo.—Professor Robyn's flora* of the Albert National Park is almost certainly the most thorough account of the plants of a relatively small area in continental tropical Africa which has yet appeared. The Park is a long narrow irregular area of some 8100 sq. Km. along the Congo–Uganda border stretching from lake Kivu in the south, along the shore of lake Edward to the dense equatorial forests of the Semliki valley north of Ruwenzori in the north. Besides the western part of Ruwenzori the park includes the volcanoes north of lake Kiwu and altitudes within its borders range from 750 to 5000 m. Rainfall varies from about 900 to about 4000 mm. *per annum.* There is thus great variety of habitat and the plant formations include equatorial forest and savannah in the plains, sclerophyllous forest and scrub, mountain rain forest, bamboo forest, tree heather thickets and alpine vegetation as the mountains are ascended. The total number of species recorded is about 2000 which may be compared with a similar number for the British Isles on the one hand and for the much smaller Cape peninsula on the other. This flora is in no sense a mere compilation but is the result of a thorough revision of the species concerned which are described in clear and eminently workable keys. Only in certain cases where the material was destroyed during the war, does it appear that species have been included on the basis of written accounts only. This thoroughness, together with the ample bibliography, make the flora invaluable to any student of the montane vegetation of East or Central Africa. The production is lavish, with excellent full page line drawings to illustrate most of the families, photographs of vegetation and a coloured map of the Park showing the distribution of the main plant formations.

The only criticism to be made is almost inevitable considering that the area of the Park was only finally delimited in 1935 and that it has been investigated by travellers rather than by resident botanists. It is obvious that the earlier collectors would not collect a second time a species already found elsewhere, merely because they had entered what was to become in the future a national park. They collected as fully as possible the plants growing on the high mountains, which were obviously of interest, while the vegetation of the lowlands, which is not very different from that found in adjacent regions was comparatively neglected and it is thus certain that the flora will have to be considerably enlarged when this lowland vegetation has been given the same close attention as that of the peaks. Students of the East African flora, especially of that of Uganda, will find Professor Robyns work of the greatest value. We much look forward to the appearance of the third and last volume, which is to contain accounts of the Monocotyledons.

E. MILNE-REDHEAD.

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*Flore des Spermatophytes du Parc National Albert, by W. Robyns. Institut des Parcs Nationaux du Congo Belge, Bruxelles. Vol. I Gymnospermes and Choripétales, 1948, Vol. II Sympétales, 1947. Price 750 francs each volume.

Cyprus Trees and Shrubs.*—Hitherto there has been little help available to visitors or residents of Cyprus who may be interested in identifying the wild plants of the island. In fact the only work with any claims to completeness, Holmboe's Studies in the Vegetation of Cyprus (1914), has no aids to determination in the form of keys or uniform descriptions, and it has, besides, long been expensive and difficult to obtain. The appearance of Mrs. Chapman's handbook of the trees and shrubs of Cyprus is therefore most welcome, for it is well provided with keys, and each plant mentioned is accompanied by a short and simply worded description. Technical terms are, of course, unavoidable, but the author caters for the untrained reader by a descriptive "introduction to glossary", a glossary and a few diagrammatic figures illustrating the more frequent terms. Probably no author of a handbook has ever written sections corresponding to these to his own complete satisfaction, but Mrs. Chapman has done well and one point of criticism alone needs mention, and that only because it may affect the use of the key to the families. A catkin is defined as a pendulous or drooping spike (pp. 8, 13) : this may cause confusion even amongst the few amentiferous plants of the Cyprus flora, for in *Salix alba* the catkins are not pendulous, while the enthusiastic student may discover that in *Alnus* they are not simple spikes.

The keys, in so far as they have been checked, work well, although a few errors have been noted : for instance, (p. 18) *Berberidaceae* are finally separated by the character " sepals and petals similar, in whorls of 3&3 ", although to reach that point the definition " Embryo with 2 cotyledons, leaves net-veined, flowers 4-5-merous " must have been already accepted. Such errors are, however, not likely to cause serious inconvenience and there seems to be no reason why the agricultural or forestry officer, botanical student or intelligent layman should not, by using these keys, identify the woody plants of Cyprus with reasonable ease. The descriptions given are certainly sufficient to put the matter beyond doubt if read carefully and Mrs. Chapman is greatly to be congratulated on having given all those interested in the Cyprus flora a work of such practical value. In many cases the description of a plant is followed by some brief notes on its occurrence and uses, which add very considerably to the interest of the book.

The professional taxonomist and plant geographer will be interested in two new records for the island : *Ephedra procera* Fisch. & Mey. (p. 23) and *Arbutus unedo* L. (p. 59). It is indeed remarkable that such conspicuous plants should have been so long overlooked. One other record, that of *Staehelina lobeli* (p. 81) has already been published by P. H. Davis (Kew Bull. 1949, 107). It must, indeed, be mentioned that Mrs. Chapman's manuscript became sadly entangled in the delaying web of wartime activities. This is evidenced by the fact that her introduction is dated 1944, 5 years before publication was actually effected. In the intervening period other papers dealing with the Cyprus flora have been published and it is no criticism of Mrs. Chapman's work to indicate a few points which may be brought up to date. The plant referred to as

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*Cyprus Trees and Shrubs, by Esther F. Chapman. Pp. 1-88. Cyprus Government Printing Office, Nicosia, 1949. Price 10/-.

Teucrium sp. nov. (p. 67) is *T. cyprium* subsp. *kyreniae* P. H. Davis (in Kew Bull. 1949, 111) ; *Phlomis brevibracteata* Turrill, sp. nov. was published in Gardener's Chronicle, 3 ser. 117 : 48 (1945). The results of H. Lindberg's visit to the island in 1939 have appeared under the title Iter Cyprium*, and while it is not proposed to give here any detailed review of his work, three points affecting the woody vegetation may be mentioned : first, Lindberg describes a new rose under the name *Rosa chionistrae* Lindb. fil. in addition to recording *R. canina* L. and *R. dumetorum* Thuill. ; Mrs. Chapman has 2 species only, *R. dumetorum* Thuill. (as *R. canina var. dumetorum* Baker) and *R. dumalis* Bechst. Clearly the Cyprus roses deserve further study. *Sorbus aria* Crantz of Mrs. Chapman's handbook (p. 42) is equivalent to Lindberg's *Sorbus umbellata* var. *cretica* (Lindl.) C. K. Schneider, and *Pistacia atlantica* Desf. (Chapman, p. 48) is Lindberg's *P. mutica* subsp. *cypricola* (Lindb. f.) Lindb. f.

Mrs. Chapman mentions the following species on the authority of earlier writers, but their occurrence has never been confirmed : *Helianthemum chamaecistus*, *Zizyphus spina-christi*, *Erica verticillata* and *Phillyrea media*. Of these only *Erica verticillata* is vouched for by a specimen in the Kew herbarium : this is the sheet on which Lascelles' original record was based and the locality (previously unpublished) is Karmakiti, where it was found in flower in December 1901. Karmakiti is the cape north of Morphou Bay and it is to be hoped that local botanists will make a determined effort to confirm Lascelles' record, now nearly 50 years old.

B. L. BURTT.

African Birds.*—This is the last volume of this superb work except for a volume of Addenda, received since the first volume was published in 1930. It contains an account of the Weaver birds, Waxbills and Whydahs, with the most exquisitely coloured plates by Lodge, and other drawings of these charming little birds, with descriptions of their nests and eggs and general habits. The Weaver birds are especially interesting from their wonderful nests woven from grass, or strips of palm leaf, hanging in colonies from branches of trees and associated with nests of wasps or viciously stinging flying-ants, or with those of large birds, usually Raptores, Eagles, Hawks, Vultures and Marabout Storks, which act as protectors of the weaver birds, and their homes.

The result of the publication of this splendid work has been most satisfactory, as a very large number of specimens of birds and their eggs and, even more important field observations of their habits have poured into the Natural History Museum, during the appearance of the earlier volumes, and Mr. Bannerman is to be congratulated in producing this great and invaluable work.

H. N. RIDLEY.

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*Iter Cyprium, contributio ad cognitionem florae insulae Cypri. Harald Lindberg in Acta Soc. Sc. Fenn. nov. ser. B. 2, no. 7, pp. 1-37, ff. 1-24 (1946).

*The Birds of Tropical West Africa, volume VII, pp. 441 with 40 drawings in line and half tone by various artists and 14 coloured plates by George Lodge, by D. A. Bannerman, £2 15s. 0d.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS : XXXII.

E. M. Marsden-Jones and W. B. Turrill.

Genetical experiments involving plants from the French Alps.

In the last paper in this series we published field notes, scorings of wild populations, and scorings of plants grown from wild collected seed of *Silene alpina* auct., *S. glareosa*, and *S. vulgaris* from the French Alps. In this paper we deal with the results of controlled breeding experiments with some of these plants and of crosses between them and plants of other geographical origins. The following subdivisions of this part of our researches are convenient for presentation of the results :

i. *Silene glareosa.* Descriptions of stock plants. p.
ii. *S. glareosa.* Selfings. p.
iii. *S. glareosa* x *S. glareosa.* p.
iv. *S. alpina.* Descriptions of stock plants. p.
v. *S. alpina.* Selfings. p.
vi. *S. alpina* x *S. alpina.* p.
vii. *S. glareosa* x *S. alpina* and reciprocal. p.
viii. *S. glareosa* x *S. maritima.* p.
ix. *S. alpina* x *S. maritima.* p.
x. *S. glareosa* x *S. vulgaris.* p.
xi. *S. alpina* x *S. vulgaris* and reciprocal. p.
xii. *S. vulgaris*, *S. glareosa*, and *S. alpina* x *S. vulgaris* (Norway). p.
xiii. Selfing of and crosses involving *S. glareosa* from the Tyrol. p.
xiv. Crosses involving *S. glareosa* with emarginate petals. p.

For scoring petal colours we have used the following symbols :

W=White.

X=Upper and lower surfaces very dilute Pale Laelia Pink, veins on lower surface Pale Laelia Pink.

Y=Upper surface Pale Laelia Pink, lower surface Laelia Pink.

Z=Upper surface Laelia Pink, lower surface Tourmaline Pink.

(see Ridgway, Color Standards, Pl. XXXVIII.).

The crossing of *S. glareosa* with *S. vulgaris* from Loch Tay resulted in a modification of the anthocyanin colours recorded for Loch Tay Plants (K.B. 1940, 67). The colour classes accepted in this paper for scoring hybrids so made are :

Dy : upper surface Eupatorium Purple (Ridgway Pl. XXXVIII.); lower surface Vinaceous Purple (Ridgway Pl. XXXVIII.).

My : upper surface Laelia Pink (Ridgway Pl. XXXVIII.), lower surface Tourmaline Pink (Ridgway Pl. XXXVIII.).

Py : both surfaces Pale Laelia Pink (Ridgway Pl. XXXVIII.).

MY : Marguerite Yellow (Ridgway Pl. XXX.).

W=White.

i. DESCRIPTIONS OF STOCK PLANTS OF SILENE GLAREOSA.

S. glareosa. K. 1094/11. St. Nizier.

Habit : loose and suberect ; stems up to 4·5 dm. ; medium anthocyanin in vegetative parts ; glabrous.

Leaves : elliptic-linear, acuminate, 2·9 cm. long, 0·7 cm. broad, margins eciliate.

Inflorescence : up to 6 flowered.

Calyx : narrowly subinflated, with medium anthocyanin.

Corolla : colour X, with petals and segments not overlapping ; petals 12 mm. long, 4·5 nm. broad, bilobed, 3/4, boss, anthocyanin blotch absent.

Filaments and anthers : purple.

Sex : female (later hermaphrodite and female).

Stigmata : purple ; immature seeds purple.

Mature seeds : weak tubercled to weak armadillo, with fluctuations.

Ripe capsules : obloid, small, of *S. maritima* type, slightly contracted above, without teeth 5 mm. long, 5·5 mm. broad, mouth 3 mm. diameter, teeth each an isosceles triangle, 2 mm. long, 1·5 mm. broad at base, strongly recurved ; carpophore 2·5 mm. long, 1·5 mm. broad.

Under controlled selfing 8 flowers gave 241 seeds.

S. glareosa. K. 1094/20. St. Nizier.

Habit : suberect, ascending branches, stems up to 3·0 dm. long ; glabrous ; anthocyanin in vegetative parts medium.

Leaves : narrowly elliptic to narrowly lanceolate, acute to very shortly acuminate, 3·0 cm. long, 0·8 cm. broad, margins eciliate.

Inflorescence : 3 to 5 flowered.

Calyx : subinflated, with little anthocyanin.

Corolla : colour X ; with petals and segments not overlapping ; petals 12·5 mm. long, 3·5 mm. broad, bilobed, 3/4, small scale, anthocyanin blotch absent.

Sex : female.

Stigmata : purple ; immature seeds purple.

Ripe capsules : *S. maritima* type, ovoid-obloid.

Mature seeds : weak tubercled to weak armadillo, there is fluctuation in the sample.

Capsules : ovoid-obloid, slightly contracted above, without the teeth 7 mm. long, 7·5 mm. broad, mouth 4 mm. in diameter ; teeth each an isosceles to equilateral triangle, 2 mm. long, 1·5–2 mm. broad at base, strongly recurved ; carpophore 3 mm. long, 2 mm. broad.

S. glareosa. K. 1094/52.

Habit : prostrate, with flowering branches ascending ; stems up to 3·2 dm. long ; medium anthocyanin in vegetative parts ; glabrous.

Leaves : narrowly elliptic-linear, shortly acuminate, 1·7 cm. long, 0·35 cm. broad, margins eciliate.

Inflorescence : up to 7 flowered.

Calyx : subinflated, with medium anthocyanin.

Corolla : colour Y, with petals and segments not overlapping ; petals 15 mm. long, 4·5 mm. broad, bilobed, 3/4, small scale, anthocyanin blotch present.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo.

Ripe capsules : small, of *S. maritima* type, slightly contracted above, obloid, without teeth 5 mm. long, 6 mm. broad, mouth 4 mm. diameter, teeth each an isosceles triangle, 1·5 mm. long, 1 mm. broad at base, strongly recurved ; carpophore 2 mm. long, 1·5 mm. broad.

Under controlled self-pollination 15 flowers gave 48 seeds.

S. glareosa. K. 1095/14.

Habit : spreading and suberect, stems up to 3·5 dm. long ; little anthocyanin in vegetative parts ; glabrous.

Leaves : elliptic-linear, acuminate, 2·3 cm. long, 0·55 cm. broad, margins eciliate.

Inflorescence : 3 flowered.

Calyx : subinflated, with medium anthocyanin.

Corolla : colour X, with petals and segments not overlapping. Petals 15 mm. long, 4·5 mm. broad, bilobed, 3/4, boss, anthocyanin blotch present.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo.

Ripe capsules : small, of *S. maritima* type, obloid, slightly contracted above, without the teeth 4·5 mm. long, 6 mm. broad, mouth 3 mm. diameter, teeth each an equilateral triangle, 2 mm. long, 2 mm. broad at base, strongly recurved ; carpophore 2·5 mm. long, 2 mm. broad.

Under controlled self-pollination 33 flowers gave 315 seeds.

S. glareosa. K. 1099/8.

Habit : suberect, ascending branches, stems up to 4·5 dm. long ; glabrous.

Leaves : narrowly elliptic, acute to shortly acuminate, 1·9 cm. long, 0·75 cm. broad, margins eciliate.

Inflorescence : 3–7 flowered.

Calyx : subinflated ; with medium anthocyanin.

Corolla : colour Y, with petals and segments not overlapping. Petals 14 mm. long, 4·5 mm. broad, bilobed, 3/4, boss,anthocyanin blotch present.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo.

Ripe capsules : small, of *S. maritima* type, obloid, without teeth 5 mm. long, 6 mm. broad ; mouth 3 mm. diameter ; teeth each an isosceles triangle, 2 mm. long, 1·5 mm. broad at base, strongly recurved ; carpophore 3 mm. long, 2 mm. broad.

Under controlled self-pollination 8 flowers gave 20 seeds.

S. glareosa. K. 1099/32.

Habit : erect ; stems up to 3·5 dm. long ; much anthocyanin in vegetative parts ; glabrous.

Leaves : elliptic-linear, acuminate, 2·2 cm. long, 0·55 cm. broad, margins eciliate.

Inflorescence : up to 3 flowered.

Calyx : narrow, with medium anthocyanin.

Corolla : colour Y, with petals and segments not overlapping ; petals 15 mm. long, 4·5 mm. broad, bilobed, 3/4, small scale, anthocyanin blotch absent.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds white.

Mature seeds : armadillo.

Ripe capsules : small, of *S. maritima* type, obloid, without the teeth 5·5 mm. long, 6·5 mm. broad ; mouth 4 mm. diameter ; teeth each an isosceles triangle, strongly recurved, 2 mm. long, 1·5 mm. broad at base ; carpophore 3 mm. long, 2 mm. broad.

S. glareosa. K. 1099/46.

Habit : spreading, subprostrate, ascending at ends ; stems up to 4·5 dm. long ; medium anthocyanin in vegetative parts ; glabrous.

Leaves : narrowly elliptic, acute to very shortly acuminate, 2·6 cm. long, 0·6 cm. broad, margins eciliate.

Inflorescence : 3 to 4 flowered.

Calyx : narrow, with medium anthocyanin.

Corolla : colour Y, petals and segments not overlapping ; petals 14 mm. long, 6 mm. broad, bilobed, 3/4, boss, anthocyanin blotch present.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo (slightly verging towards weak armadillo).

Ripe capsules : small, of *S. maritima* type, obloid, without teeth 4·5 mm. long 6 mm. broad ; mouth 3 mm. diameter ; teeth each an isosceles triangle, strongly recurved, 1·5 mm. long, 1 mm. broad at base ; carpophore 2 mm. long, 1·5 mm. broad.

Under controlled selfing 19 flowers produced 250 seeds.

ii. S. GLAREOSA SELFINGS.

N. 199=*S. glareosa* K. 1094/11 selfed. 7 plants in the family.

Stem length : up to 4·5 dm.

Habit : Uniform, loose and suberect.

Anthocyanin in vegetative parts : medium 7.

Leaves : as parent, elliptic-linear, acuminate, 3·2 cm. long, 0·5 cm. broad.

Indumentum : glabrous 7.

Inflorescence : up to 6 flowered.

Anthocyanin in calyx : medium 7.

Calyx : narrowly subinflated 7.

Corolla colour : X 4 : W 3 ; petals : bilobed 7 : 3/4 lobing 7 ; small scales 1 : boss 6 ; anthocyanin blotch : present 3 : absent 4 ; petals and segments not overlapping 7.

Filaments and anthers : purple 5.

Sex : hermaphrodite 5 : female 2.

Stigmata : purple 7.

Immature seeds : purple 2 : white 5.

Mature seeds : tubercled 7.

Capsules : as *S. maritima* and obloid 7.

All died down, no overwatering barren stems.

N. 169=*S. glareosa* K. 1099/32 selfed. 22 plants in the family.

Stem length : up to 3·1 dm.

Habit : erect.

Anthocyanin in vegetative parts : much 22.

Leaves : as parent, elliptic-linear, acuminate, 1·8 cm. long, 0·4 cm. broad.

Indumentum : glabrous 22.

Inflorescence : 3 flowered.

Anthocyanin in calyx : medium 22.

Calyx : narrow 22.

Corolla colour : Y ; petals : bilobed 22, 3/4-lobing 22, boss 22 ; anthocyanin blotch absent 22. Petals and segments not overlapping 22.

Filaments and anthers : purple 3.

Sex : hermaphrodite 2 : hermaphrodite and female 1 : female 19.

Stigmata : purple 22.

Immature seeds : white 18.

Mature seeds : armadillo 18.

Capsules : *S. maritima* type and obloid 21.

All died down, no overwintering barren shoots.

N. 183=*S. glareosa* K. 1094/52 selfed. 1 plant in the family.
Habit : prostrate with flowering branches ascending.
Anthocyanin in vegetative parts : medium.
Indumentum : glabrous.
Inflorescence : 1–4 flowered.
Anthocyanin in calyx : little.
Calyx shape : subinflated.
Corolla colour : white ; petals bilobed, 1/2-lobing, boss, anthocyanin blotch absent, petals and segments not overlapping.
Filaments and anthers : purple.
Sex : hermaphrodite and female.
Stigmata : purple.
Immature seeds : white.
Mature seeds : armadillo.
Capsules : *S. maritima* type and obloid-ovoid.
All died down, no overwintering barren shoots.

N. 185=*S. glareosa* K. 1095/14 selfed. 22 plants in the family.
Stem length : up to 3·6 dm.
Habit : spreading and suberect.
Anthocyanin in vegetative parts : little.
Indumentum : glabrous 22.
Leaves : as parent, elliptic-linear, acuminate, 3·1 cm. long, 0·6 cm. broad, as parent.
Inflorescence : 2 to 7, mostly 3, flowered.
Anthocyanin in calyx : medium (in veins) 22.
Calyx : inflated 2 : subinflated 20.
Corolla colour : X 8 : W 13 ; petals bilobed 22 ; 3/4-lobing 22, boss 22 ; anthocyanin blotch : present 14 : absent 8 ; petals and segments not overlapping 22.
Filaments and anthers : purple 21.
Sex : hermaphrodite 21 : female 1.
Stigmata : purple 22.
Immature seeds : purple 22.
Mature seeds : armadillo 22.
Capsules : *S. maritima* type and obloid 22.
All died down, no overwintering barren shoots.

N. 194=K. 1099 plant 8 selfed. 1 seedling raised but did not flower.

N. 265=K. 1099 plant 8 selfed. No family raised.

N. 179 and **N. 219**=K. 1099 plant 46, selfed. No families raised. The two selfings were made in 1935 and 1936 respectively. Apparently good seed was produced in fair quantity ; 20 capsules from selfed flowers gave 262 seeds. Seed germination failed completely.

iii. S. GLAREOSA x S. GLAREOSA.

N. 211=*S. glareosa* K. 1094/20 x *S. glareosa* K. 1099/8. 14 plants in the family. Under controlled pollination 6 flowers gave 149 seeds.

Stem length : up to 4 dm.

Habit : subprostrate, ascending at ends, spreading.

Anthocyanin in vegetative parts : medium 7 : little 7.

Indumentum : glabrous 14.

Leaves : linear-elliptic to elliptic-linear.

A. 3·0 cm. long, 0·6 cm. broad : 211/4.
B. 1·7 cm. long, 0·2 cm. broad : 211/9, 211/13, 211/5, 211/6.
C. 2·6 cm. long, 0·55 cm. broad : 211/7, 211/10, 211/1, 211/3, 211/8, 211/2, 211/12, 211/11.

Inflorescence : 5 to 9 flowered.

Anthocyanin in calyx : much 5 : medium 9.

Calyx : inflated 5 : subinflated 9.

Corolla colour : W 4 : X 8 : Y 2 ; petals : bilobed 14, 3/4-lobing 14, small scales 2 : boss 12 ; anthocynanin blotch : present 12 : absent 2 ; petals and segments not overlapping 14.

Sex : female 14.

Stigmata : purple 14.

Immature seeds : purple 14.

Mature seeds : armadillo 14.

Capsules · obloid 13 : obloid-ovoid 1. All *S. maritima* type.

N. 212=*S. glareosa* K. 1094/20 x *S. glareosa* K. 1099/46. 10 plants in the family. Under controlled pollination 5 flowers produced 114 seeds.

Stem length : up to 4·9 dm.

Habit : spreading, subprostrate, ascending at ends.

Anthocyanin in vegetative parts : medium 8 : little 2.

Indumentum : glabrous 10.

Leaves : small, narrowly elliptic-linear, acute to shortly acuminate, 1·4 cm. long, 0·3 cm. broad.

Inflorescence : 7 to 13 flowered.

Anthocyanin in calyx : much 1 : medium 9.

Calyx : inflated 3 : subinflated 7.

Corolla colour : W 1 : X 2 : Y 7 ; petals : bilobed 10, 3/4-lobing 10, boss 10.

Anthocyanin blotch : present 8 : absent 2, petals and segments not overlapping 10.

Sex : female 10.

Stigmata : purple 10.

Immature seeds : purple 10.

Mature seeds : tubercled 5 : weak armadillo 2 : armadillo 3.

Capsules : *S. maritima* type and obloid 10.

N. 266=*S. glareosa* K. 1094/20 x *S. glareosa* K. 1095/14. 25 plants in the family.

Stem length : up to 5·6 dm.

Habit : stems suberect, vegetative parts subspreading ; uniform as *S. glareosa* type.

Anthocyanin in vegetative parts : little 25.

Leaves : narrowly elliptic-linear, shortly acuminate, 2·1 cm. long, 0·5 cm. broad.

Indumentum : glabrous 25.

Inflorescence : 5 to 9 flowered.

Anthocyanin in calyx : medium 25.

Calyx : subinflated 25.

Corolla colour : W 13 : X 12 ; petals : bilobed 25, 3/4-lobing 25, scales 4 : small scales 11 : boss 10, anthocyanin blotch : present 6 : absent 19, petals and segments not overlapping 25.

Filaments and anthers : purple 25.

Sex : hermaphrodite 25.

Stigmata : purple 25.

Immature seeds : purple 25.

Mature seeds : weak armadillo 6 : armadillo 19.

Capsules : *S. maritima* type 25, obloid 24 : ovoid 1.

N. 188=*S. glareosa* K. 1094 plant 11 x *S. glareosa* K. 1095 plant 14. Under controlled pollination this cross gave no viable seed.

Silene glareosa, selfings and intraspecific crossings.

On the whole the families raised were small. All plants died down in the winter. Anthocyanin in vegetative parts (much, medium, or little) bred true on selfing except for some segregation in N. 185. On intraspecific crossing, in F_1 segregation occurred except in N. 266. All plants of parents and offspring were glabrous. The number of flowers per inflorescence remained low and ranged from 1 to 7 in families from selfings and 5 to 13 in families from intraspecific crossings. In the parent plants the range was 3 to 7. All plants had anthocyanin in the calyx ; except for one plant (N. 183), selfings bred true as did one family from a cross. Two families from crosses segregated into much and medium anthocyanin. All plants had zygomorphic flowers. Calyx shape bred true on selfing except for some segregation in N. 185. Two families from crossings segregated, and one bred true to the calyx shape of both parents. All families segregated for petal colour, except N. 169 which resulted from a selfing and bred true to the parental colour. All families had bilobed flowers with 3/4-lobing, except one plant with 1/2-lobing (N. 183). The majority of plants in all families except N. 266, had a corona of boss type ; small scales segregated in N. 199 and N. 211, and both scales and small scales in N. 266 (a crossing). Segregation for presence or absence of anthocyanin blotch occurred in N. 199, N. 185, N. 211, N. 212, and N. 266. In all plants petals and segments were not overlapping. In all plants, filaments, anthers, and stigmata were purple. All crossings gave only plants with immature seeds purple. Segregation in selfings occurred in N. 199 and N. 183. For mature seeds, N. 169, N. 183, and N. 185 bred true to armadillo from selfed armadillo parents. N. 199 gave only tubercled seeds from a selfed parent with seeds fluctuating from weak tubercled to weak armadillo. K. 1094 plant 20 had weak tubercled to weak armadillo seeds. Crossed with three different plants as pollen parents, it gave with K. 1099 plant 8 only armadillo but segregated with K. 1099 plant 46 and K. 1095 plant 14. K. 1099 plant 46 had armadillo seeds verging towards weak armadillo, the other two had armadillo seeds. All plants had capsules of *S. maritima* type.

K. 1094 plant 20 had female (F.) flowers ; K. 1095 plant 14, K. 1099 plant 8, K. 1099 plant 46 had hermaphrodite (H.) flowers. K. 1095 plant 14 selfed gave H. 23 : H.F. 1 : F. 2. Crossings : K. 1094 plant 20 x K. 1099 plant 8 gave F. 14. K. 1094 plant 20 x K. 1099 plant 46 gave F. 10. K. 1094 plant 20 x K. 1095 plant 14 gave H. 25.

One is forced to the conclusion that the pollen parent here genetically contributed to the development of stamens.

iv. DESCRIPTIONS OF STOCK PLANTS OF SILENE ALPINA.

S. alpina K. 1085/5.

Habit : subcompact, spreading outwards at margin ; stems up to 2 dm. long ; medium anthocyanin in vegetative parts ; indumentum short and bristly, few hairs on stems.

Leaves : elliptic, acute or apiculate, 1·2 cm. long, 0·65 cm. broad, margins strongly setulose-ciliate, glaucous-green, densely hairy.

Inflorescence : 1–3 flowered.

Calyx : subinflated ; with much anthocyanin.

Corolla : with petals and segments both diverging ; petal colour X, 12·5 mm. long, 3·5 mm. broad, bilobed, 2/3 lobing, boss, anthocyanin blotch present.

Sex : female (later hermaphrodite and female).

Stigmata : purple ; immature seeds purple.

Ripe capsules : *S. maritima* type, obloid, slightly contracted above, without the teeth 6 mm. long, 7 mm. broad, mouth 4 mm. diameter ; teeth each an isosceles to equilateral triangle, 2 mm. long, 2 mm. broad at base, strongly recurved ; carpophores 3 mm. long, 2 mm. broad.

Mature seeds : armadillo.

S. alpina K. 1085/13.

Habit : subcompact, branches spreading at margin ; stems up to 1·5 dm. long ; medium anthocyanin in vegetative parts ; few short bristly hairs on stems.

Leaves : narrow elliptic tapering to ends, acute, 1·7 cm. long, 0·6 cm. broad, margins strongly setulose-ciliate, glaucous green, with dense short bristly hairs.

Inflorescence : 1–2 flowered.

Calyx : subinflated, with medium anthocyanin.

Corolla : colour X ; petals and segments not overlapping ; petals 12 mm. long, 3 mm. broad, bilobed, 3/4, boss, anthocyanin blotch absent.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Ripe capsules : of *S. maritima* type, obloid, slightly contracted above, without the teeth 6 mm. long, 7 mm. broad, mouth 3·5 mm. diameter ; teeth 2 mm. long, 1·5 mm. broad at base, each an isosceles triangle, strongly recurved ; carpophore 3 mm. long, 2 mm. broad.

Mature seeds : armadillo.

Under controlled selfing 4 flowers produced 47 seeds.

S. alpina K. 1085/15.

Habit : subcompact, spreading outwards at margin ; stems up to 1·5 dm. long ; medium anthocyanin in vegetative parts ; stems glabrous.

Leaves : elliptic, acute, 1·7 cm. long, 0·7 cm. broad, margins strongly setulose-ciliate, glaucous green, indumentum medium of short and bristly hairs.

Inflorescence :1–3 flowered.

Calyx : subinflated ; with medium anthocyanin.

Corolla : with petals and segments both diverging ; petal colour X, 12 mm. long, 3 mm. broad, bilobed, 3/4-lobing, boss, blotch absent.

Sex : female

Stigmata : purple ; immature seeds purple.

Ripe capsules : ovate, of *S. maritima* type, slightly contracted above, without teeth 7 mm. long, 6 mm. broad, mouth 4 mm. diam. ; teeth each an isosceles to equilateral triangle 1·5–2 mm. long, 1·5 mm. broad at base, strongly recurved ; carpophore 3 mm. long, 2 mm. broad.

Mature seeds : armadillo.

S. alpina K. 1085/24.

Habit : compact and branches spreading at margins ; stems up to 1·7 dm. long ; much anthocyanin in vegetative parts ; stems glabrous.

Leaves : elliptic, apiculate, 1·2 cm. long, 0·7 cm. broad, margins setulose-ciliate, green, with few short bristly hairs.

Inflorescence : 1–2 flowered.

Calyx : inflated ; with medium anthocyanin.

Corolla colour X ; with petals and segments not overlapping ; petals 14·5 mm. long, 5·5 mm. broad, bilobed, 3/4 lobing, boss, anthocyanin blotch present.

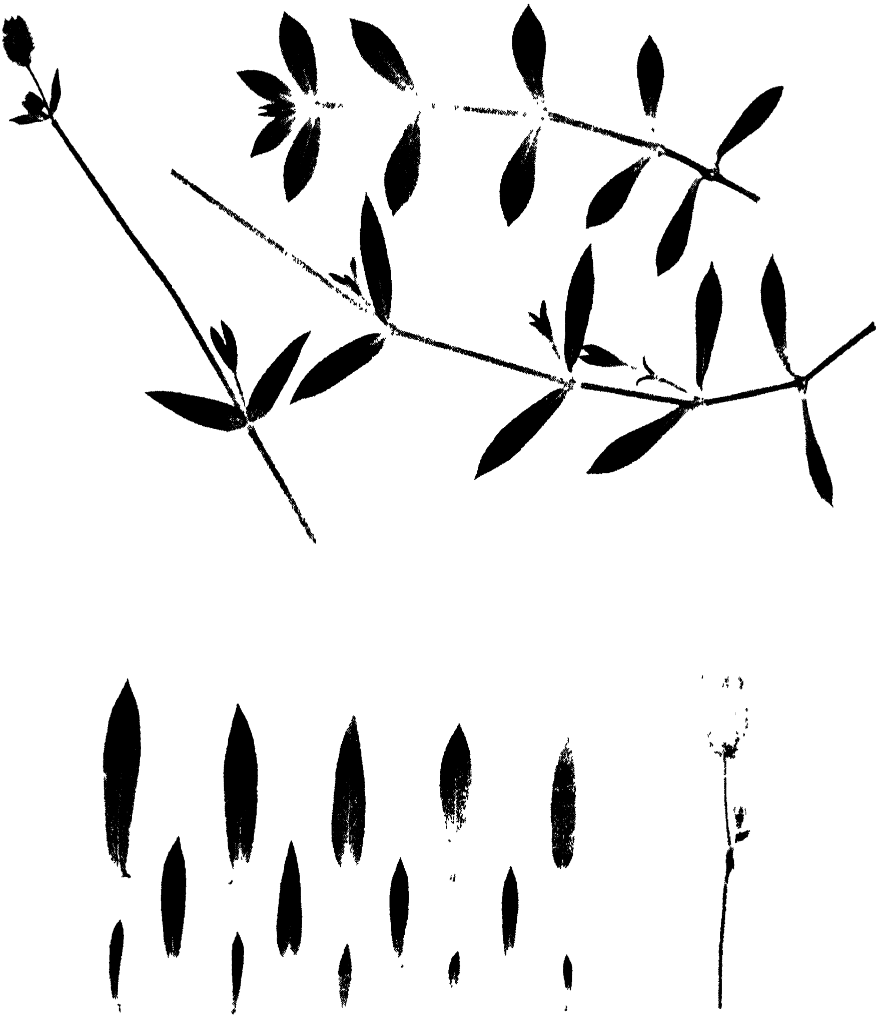
Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

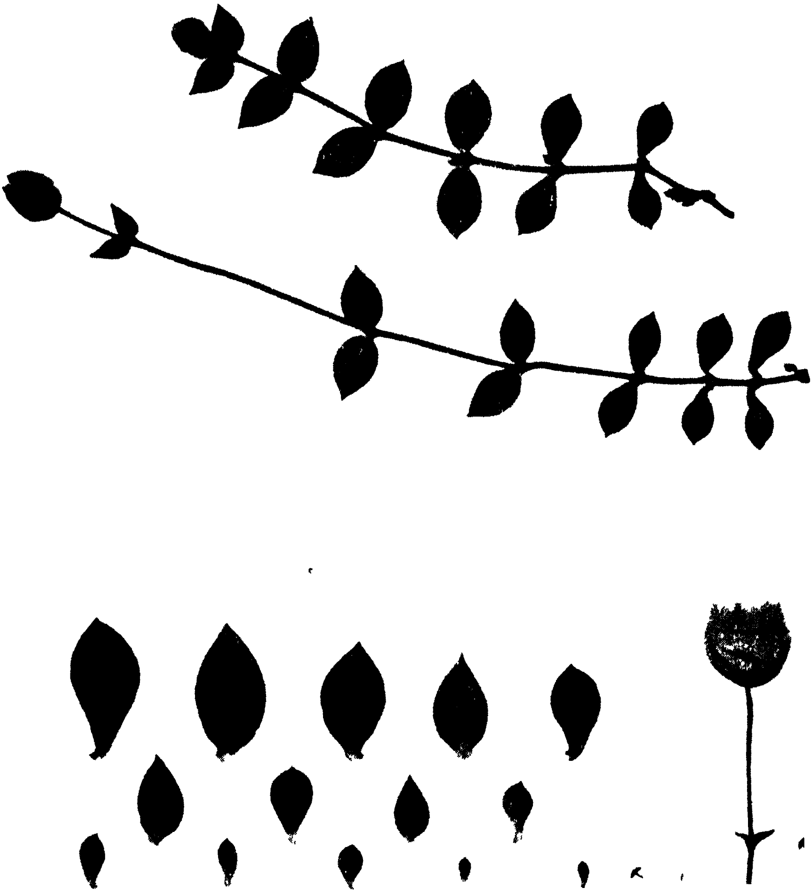
Mature seeds : armadillo.

Plate 3



Silene glareosa K 1094 plant 11.

Plate 4



Silene alpina. K 1085 plant 24.

Ripe capsules : *S. maritima* type, obloid, slightly contracted above, without the teeth 6 mm. long, 7 mm. broad, mouth 3 mm. diameter ; teeth each an equilateral triangle, 1·5 mm. long, 1·5 mm. broad at base, strongly recurved ; carpophore 3 mm. long, 3·2 mm. broad.

Selfed under control 29 flowers produced 778 seeds.

S. alpina K. 1085/48.

Habit : subcompact, spreading outwards at margin ; stems up to 2 dm. long ; medium anthocyanin in vegetative parts ; stems glabrous.

Leaves : broadly elliptic, acute, 1·3 cm. long, 0·7 cm. broad, margins strongly setulose-ciliate, glaucous-green, indumentum medium of short bristly hairs.

Inflorescence : 1–3 flowered.

Calyx : subinflated ; with much anthocyanin.

Corolla colour Y ; petals 17·5 mm. long, 6 mm. broad, bilobed, 3/4 lobing, boss, blotch present, petals and segments not overlapping.

Sex : hermaphrodite ; anthers purple, filaments purple.

Stigmata : purple ; immature seeds purple.

Ripe capsules : of *S. maritima* type, ovoid, slightly contracted above, without the teeth, 6 mm. long, 5·5 mm. broad ; teeth 1·5 mm. long, 1 mm. broad at base, each an isosceles triangle, strongly recurved ; carpophore 3 mm. long, 1 mm. broad.

Mature seeds : armadillo.

S. alpina K. 1085/57.

Habit : subcompact, spreading ; stems up to 2 dm. long ; much anthocyanin in vegetative parts ; stems glabrous.

Leaves : rounded-elliptic, apiculate, 1·6 cm. long, 1·0 cm. broad, margins with few or no setulose cilia, green, glabrous.

Inflorescence : 1–2 flowered.

Calyx : subinflated, with much anthocyanin.

Corolla colour X ; with petals and segments not overlapping ; petals bilobed, 3/4, boss, anthocyanin blotch present.

Sex : female (later hermaphrodite and female).

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo.

Ripe capsules : obloid, slightly constricted above, without the teeth 6·5 mm. long, 7·5 mm. broad, mouth 4 mm. diameter ; teeth each an equilateral triangle, 2 mm. long, 2 mm. broad at base, strongly recurved ; carpophore 3·5 mm. long, 2 mm. broad.

Sterility : On selfing under control this plant was almost completely sterile, 40 flowers produced only 9 seeds.

S. alpina K. 1091/4.

Habit : subcompact, branches spreading at margin ; stems up to 2 dm. long ; medium anthocyanin in vegetative parts ; medium short bristly hairs on stems.

Leaves : narrowly elliptic to narrowly elliptic-obovate acuminate to apiculate, 2·1 cm. long, 0·8 cm. broad, margins strongly setulose-ciliate, glaucous geen, with dense short bristly hairs.

Inflorescence : 1–3 flowered.

Calyx : narrow, with medium anthocyanin.

Corolla : Colour X, with petals and segments not overlapping ; petals 15·5 mm. long, 5·5 mm. broad, bilobed, 3/4, boss, anthocyanin blotch absent.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple ; immature seeds purple.

Mature seeds : armadillo.

Ripe capsules : obloid-ovoid, *S. maritima* type, slightly contracted above, without the teeth, 7 mm. long, 7 mm. broad, mouth 3·5 mm. diameter ; teeth each an isosceles triangle, 1·5 mm. long, 1 mm. broad at base, carpophore 3·5 mm. long, 2 mm. broad.

Selfed under control 25 flowers produced 248 seeds.

v. SILENE ALPINA SELFINGS.

N. 165=*S. alpina* K. 1085/24 selfed. 4 plants in the family.

Length of stems up to 1·3 dm.

Habit : uniform as parent.

Anthocyanin in vegetative parts : much 4.

Indumentum : of stem : glabrous 4 ; of leaves : glabrous 2 : few 2.

Inflorescence : 1–2 flowered.

Anthocyanin in calyx : medium 2.

Calyx : inflated 2.

Corolla colour : X (2 not flrd.) ; petals bilobed 2, 3/4-lobing 2, boss 2 ; anthocyanin blotch : present 1 : absent 1 ; not overlapping in both petals and segments 2.

Sex : female 2.

Stigmata : purple 2.

Mature seeds : armadillo 2.

Capsules : *S. maritima* type 2.

No overwintering barren stems.

N. 160=*S. alpina* K. 1085/5 selfed. 2 plants in the family.

Length of stem up to 2 dm.

Habit subcompact, spreading at edges, as parent.

Anthocyanin in vegetative parts : medium.

Indumentum short and bristly : of stems : few hairs ; of leaves : dense.

Inflorescence : 1–2, mostly 1 flowered.

Anthocyanin in calyx : much 2.

Calyx : inflated 2.

Corolla colour : X 2 ; petals bilobed, 3/4 lobing 1 : 2/3 lobing 1, boss 2, anthocyanin blotch : present 1 : absent 1; not overlapping in both petals and segments 2.

Sex : female 2.

Stigmata : purple 2.

Immature seeds : purple 2.

Mature seeds : armadillo 2.

Capsules : *S. maritima* type and obloid 2.

No overwintering barren stems ; plants died down completely.

The following selfings were made from which no families were raised though most often apparently " good " seeds were formed, often in considerable quantity : K. 1085, plants 5, 13, 15, 24, 48, 57; K. 1091, plant 4. Some of these were selfed in two consecutive years with similar results.

vi. SILENE ALPINA x S. ALPINA.

N. 159=*S. alpine* K. 1085/5 x *S. alpina* K. 1085/13. 8 plants in the family.

Length of stems : up to 2 dm.

Habit : compact centre, suberect flowering branches, as *S. alpina.*

Anthocyanin in vegetative parts : 8 medium.

Indumentum : of stems : dense 1 : few 3 : glabrous 4 ; of leaves : dense 5 : glabrous 3.

Leaves : elliptic to ovate-elliptic, acute, 1·85 cm. long, 1·0 cm. broad.

Inflorescence : 1–2 flowered.

Anthocyanin in calyx : medium 8.

Calyx : inflated 1 : subinflated 7.

Corolla colour : X 2 : W 6 ; petals : bilobed 8, 3/4-lobing 8 ; small scales 2 : boss 6, anthocyanin blotch : present 6 : absent 2.

Overlapping : not overlapping of both petals and segments 8.

Sex : hermaphrodite 8.

Filaments and anthers : purple 8.

Stigmata : purple 8.

Immature seeds : purple 8.

Mature seeds : armadillo 8.

Capsules : *S. maritima* type and obloid 8. All died down, no overwintering barren stems.

N. 164=*S. alpina* K. 1085/24 x *S. alpina* K. 1085/13. 9 plants in the family.

Length of stems : up to 2 dm.

Habit : uniform subprostrate.

Anthocyanin in vegetative parts : much 9.

Indumentum : when present, of short bristles ; of stems : medium 1 : few 3 : glabrous 5 ; of leaves : much 2 : medium 2 : few 1 : glabrous 4.

Leaves : elliptic to narrowly elliptic, apiculate to acute, 1·8 cm. long, 0·8 cm. broad.

Inflorescence : 1–3 flowered.

Anthocyanin in calyx : medium 8.

Calyx : subinflated 8.

Corolla colour : X 6 : Y 2 ; petals : bilobed 8 3/4-lobing 8, boss 8.

Anthocyanin blotch : present 5 : absent 3 petals and segments not overlapping 7 : petals not overlapping and segments overlapping 1.

Sex : hermaphrodite 1 : female 7.

Filaments and anthers : purple 1.

Stigmata : purple 8.

Immature seeds : purple 8.

Mature seeds : armadillo 8.

Capsules : *S. maritima* type and obloid 8.

All died down, no overwintering barren stems.

Silene alpina, selfings and intraspecific crossings.

Families raised were small though often there was abundant apperently good seed. All plants died down in the winter. Anthocyanin in vegetative parts bred true for medium or much respectively; two plants with medium on crossing gave medium, but a plant with much, pollinated from one with medium, gave much in all offspring. For indumentum, on selfing one plant bred true and another segregated. Two intraspecific crossings gave segregation for indumentum. The number of flowers per inflorescence was 1 to 3 in all plants. All plants had anthocyanin in calyces. All plants had zygomorphic flowers. Calyx shape of subinflated type did not breed true on selfing but inflated did. Inflated crossed subinflated gave only subinflated. Selfings bred true for petal colour, intraspecific crossings segregated. All plants had bilobed petals and all had 3/4-lobing except K. 1085 plant 5 with 2/3-lobing and the family (N. 160) derived from a selfing of it. All plants had boss corona except in one intraspecific cross which threw 2 plants with small scales. Segregation occurred in all families for presence or absence of blotch. In all plants petals and segments were not overlapping except in one plant (in N. 164) with overlapping segments. All plants had purple stigmata and immature seeds (where scored). All plants had armadillo seeds and *S. maritima* type capsules.

K. 1085 plant 5 had female (F.) flowers in the earlier part and hermaphrodite and female flowers (H.F.) in the later part of the flowering season. K. 1085 plant 13 and K. 1085 plant 24 had hermaphrodite (H.) flowers. K. 1085 plant 5 and K. 1085 plant 24 selfed gave only F. In intraspecific crosses :

K. 1085 plant 24 x K. 1085 plant 13 gave H. 1 : F. 7.

K. 1085 plant 5 x K. 1085 plant 13 gave H. 8.

vii. SILENE GLAREOSA x S. ALPINA AND RECIPROCAL.

N. 173=*S. glareosa* K. 1094/11 x *S. alpina* K. 1091/4. 16 plants in the family.

Stem length : up to 2·9 dm.

Habit : intermediate between parents, uniform subcompact centres, spreading and subascending flowering branches.

Anthocyanin in vegetative parts : medium 16.

Indumentum : on stems : medium 1 : few 6 : glabrous 9 ; on leaves : dense 10 : medium 3 : few 1 : glabrous 2.

Leaves : narrowly elliptic-linear, shortly acuminate, 2·4 cm. long, 0·4 cm. broad. Leaves of *S. glareosa* type.

Inflorescence : up to 5 flowered.

Anthocyanin in calyx : much 16.

Calyx : narrow 16.

Corolla colour : W 10 (2 with tinge of colour in veins) : X 6 ; petals : bilobed 16, 3/4-lobing 16, small scale 1 : boss 15, anthocyanin blotch : present 5 : absent 11 ; petals and segments not overlapping 16.

Sex : hermaphrodite 9 : female 7.

Filaments and anthers : purple 9.

Stigmata : purple 16.

Immature seeds : purple 16.

Mature seeds : tubercled 5 : weak armadillo 10 : armadillo 1.

Capsules : *S. maritima* type and obloid 16.

Died down in winter.

N. 356=N. 173/4 selfed. 7 plants in the family.

Stem length : up to 2·8 dm.

Habit : subcompact at centre, stems prostrate and spreading.

Anthocyanin in vegetative parts : medium 7.

Indumentum : on stems medium 3 : few 2 : glabrous 2 ; on leaves medium 1 : few 1 : glabrous 5.

Leaves : As F_1.

Inflorescence : 1/1, 2/6.

Anthocyanin in calyx : medium 7.

Calyx : narrow 7.

Corolla colour : X 7 ; petals : bilobed 7, 3/4-lobing 7, boss 7, anthocyanin blotch : absent 7 ; petals and segments not overlapping 7.

Filaments and anthers : purple 6.

Sex : hermaphrodite 6 : female 1.

Stigmata : purple 7.

Immature seeds : white 2.

Mature seeds : None set.

Capsules : None set.

N. 213=*S. glareosa* K. 1094/20 x *S. alpina* K. 1085/57. 2 plants in the family. Under controlled pollination 3 flowers produced 17 seeds.

Length of stem : up to 3·6 dm.

Habit : subcompact, suberect stems.

Anthocyanin in vegetative parts : medium 1 : little 1.

Indumentum : glabrous 2.

Leaves : intermediate between *S. glareosa* and *S. alpina*, obovate-elliptic, apiculate, 1·5 cm. long, 0·6 cm. broad.

Inflorescence : 7 to 9 flowered.

Anthocyanin in calyx : medium 2.

Calyx : inflated 2.

Corolla colour : W 1 : X 1 ; petals : bilobed 2, 3/4-lobing 2, corona : small scale 1 : boss 1, anthocyanin blotch : absent 2 ; petals not overlapping and segments overlapping 1 : petals and segments not overlapping 1.

Sex : female 2.

Stigmata : purple 2.

Mature seeds : armadillo 1 : weak armadillo (or weak tubercled) 1.

Capsules : *S. maritima* type 2.

N. 203=*S. alpina* K. 1085/57 x *S. glareosa* K. 1099/32. 1 plant in the family.

Length of stem : up to 1·5 dm.

Habit : subspreading or suberect.

Anthocyanin in vegetative parts : medium.

Indumentum : glabrous.

Leaves : narrowly elliptic to elliptic, acute, 1·1 cm. long, 0·5 cm. broad.

Inflorescence : 3 to 5 flowered.

Anthocyanin in calyx : medium.

Calyx : subinflated.

Corolla colour : X ; petals bilobed, 3/4-lobing, boss, anthocyanin blotch absent, petals and segments not overlapping.

Filaments and anthers : purple.

Sex : hermaphrodite.

Stigmata : purple.

Immature seeds : none set.

Capsules : none set.

The following crosses were made which did not yield viable seed :

N. 209=K. 1094 plant 20 x K. 1085 plant 48 (10 selfed flowers gave 290 apparently " good " seeds, but none germinated).

N. 214=K. 1085 plant 57 K. 1099 plant 46 (4 selfed flowers gave 17 apparently " good " seeds, of which none germinated).

Crosses involving S. alpina and S. glareosa.

Only N. 173 gave a family of moderate size and from selfing one plant of this a small F_2 family was obtained. The interesting points in these two families are :

1. The plants died down in the winter when they survived to a second season.
2. There was segregation for indumentum.
3. The leaves were of *S. glareosa* type in both F_1 and F_2.
4. Number of flowers was low.
5. Calyces were all narrow.
6. Segregation occurred for sex in both F_1 and F_2.
7. In F_1 mature seed characters segregated, including some tubercled, showing that the peculiarities of K. 1094 plant 11 influenced the result of an F_1 cross.
8. In F_2 there was complete sterility.

viii. CROSSES INVOLVING S. GLAREOSA AND S. MARITIMA.

N. 163=*S. glareosa* K. 1099 plant 32 x *S. maritima* S.P.A. 20. 67 plants in the family.

Habit : centre compact, flowering stems somewhat spreading and suberect ; all died down but 13 showed a little green ; stems up to 4 dm.

Surface : all glabrous ; all mat.

Leaves : all approximately intermediate (i.e. of H or hybrid type).

Anthocyanin in vegetative parts : medium 67.

Inflorescence : 3 to 7, mostly 3 flowered.

Calyx : subinflated 47 : cylindric 20 ; anthocyanin medium 67.

Corolla colour : W 4 : X 57 : Y 6 ; petals bilobed 64 : multilobed 3, 3/4-lobing 67, boss 6 : small scale 60 : scale 1, anthocyanin blotch present 12 : absent 55, petals overlapping 28 : not overlapping 39, segments overlapping 22 : not overlapping 45.

Sex : hermaphrodite 67.

Androecium : filaments purple 67 ; anthers purple 67.

Gynoecium : stigmata purple 67 ; immature seeds purple 67.

Capsules : *S. maritima* type 44.

Mature seeds : armadillo 39.

Sterility : Very much.

Selfed to produced F_2 family : N. 163 plant 23 : calyx subinflated ; petals X, bilobed, scale, blotch present, petals overlapping segments not overlapping.

N. 330=N. 163 plant 23 selfed. 4 plants in the family.

Habit : centre compact, spreading suberect 2 : spreading subprostrate 1 : erect 1 ; no overwintering barren shoots 2 : very few 2 ; stems up to 3·6 dm.

Surface : all glabrous ; all mat.

Leaves : M 3 : MH 1.

Anthocyanin in vegetative parts : much 2 : medium 1 : none 1.

Inflorescence : Number of flowers 2/2, 3/1, 7/1.

Calyx : subinflated 4 ; anthocyanin much 1 : medium 2 : none 1.

Corolla colour : W 1 : X 3 ; petals bilobed 2 : multilobed 2, 3/4-lobing 4, small scale 2 : scale 2, anthocyanin blotch present 2 : absent 2, petals not overlapping 4, segments overlapping 1 : not overlapping 3.

Sex : hermaphrodite 1 : hermaphrodite and female 1 : female 2.

Androecium : filaments purple 2 ; anthers purple 2.

Gynoecium : stigmata purple 3 ; white 2 ; immature seeds purple 3 : white 1.

Capsules : *S. maritima* type 3.

Mature seeds : armadillo 3.

Sterility : much.

With controlled pollination :

N. 163 plant	Total seeds	Capsules in which seeds contained	Average per capsule
23 selfed	14	54	0·26
19 selfed	36	54	0·67
8 selfed	21	43	0·49
3 selfed	13	51	0·25

N. 168=*S. glareosa* K. 1099 plant 32 x *S. maritima* S.P.A.68. 31 plants in the family.

Habit : centre compact, flowering stems somewhat spreading and suberect ; all died down in winter but 4 showed a little green ; stems up to 4·5 dm.

Surface : all glabrous ; all mat.

Leaves : approximately intermediate.

Anthocyanin in vegegative parts : medium 31.

Inflorescence : number of flowers 1 to 7, mostly 3.

Calyx : subinflated 10 : cylindric 21 ; anthocyanin medium 31.

Corolla colour : X 25 : Y 6 ; petals bilobed 28 : multilobed 3 ; 3/4-lobing 31 ; boss 14 : small scale 17 ; anthocyanin blotch present 7 : absent 24 : petals overlapping 7 : not overlapping 24 : segments overlapping 5 : not overlapping 26.

Sex : hermaphrodite 31.

Androecium : filaments purple 31 ; anthers purple 31.

Gynoecium : stigmata purple 31 ; immature seeds purple 31.

Capsules : *S. maritima* type 31.

Mature seeds : armadillo 31.

Sterility : considerable.

Selfed to produce F_2 families :

N. 167 plant 1 : calyx cylindric ; petals X, multilobed, boss, blotch absent, petals not overlapping segments not overlapping.

N. 167 plant 11 : calyx cylindric ; petals Y, bilobed, small scale, blotch absent, petals overlapping segments not overlapping.

N. 167 plant 28 : calyx subinflated ; petals X, bilobed, boss, blotch absent, petals not overlapping segments overlapping.

N. 334=N. 167 plant 1 selfed. 24 plants in the family.

Habit : compact 23 : subcompact 1 ; spreading and suberect 23 : subprostrate 1 ; overwintering barren shoots present 4 : very few low down 12 ; stems up to 4·5 dm.

Surface : all glabrous ; all mat.

Leaves : M 2 : H M 6 : M H 10 : H 6.

Anthocyanin in vegetative parts : very much 3 : much 8 : medium 13.

Inflorescence : number of flowers 1/1, 2/1, 3/14, 4/3, 5/2, 6/2, 7/1.

Calyx : subinflated 7 : cylindric 17 ; anthocyanin much 3 : medium 18 : little 3.

Corolla colour : W 7 : X 15 : Y 2 ; petals bilobed 7 : multilobed 17 ; 1/3 to 1/2-lobing 1 : 1/2 to 2/3-lobing 3 : 1/2 to 3/4-lobing 1 : 2/3 to 3/4-lobing 1 : 2/3-lobing 2 : 3/4-lobing 16 ; boss 14 : small scale 10 ; anthocyanin blotch present 4 : absent 20 ; petals overlapping 2 : not overlapping 22 ; segments not overlapping 24.

Sex : hermaphrodite 10 : hermaphrodite and female 3 : female 11.

Androecium : filaments purple 12 : white 1 ; anthers purple 13.

Gynoecium : stigmata purple 18 : white 6 : immature seeds purple 17 : white 6.

Capsules : *S. maritima* type 19.

Mature seeds : armadillo 15.

Sterility : much.

N. 331=N. 167 plant 11 selfed. 7 plants in the family.

Habit : compact 4 : subcompact 3 ; spreading and suberect 5 : subprostrate 1 : prostrate 1 ; overwintering barren shoots none or very few and low down ; stems up to 4·3 dm.

Surface : all glabrous ; all mat.

Leaves : M H 4 : H 3.

Anthocyanin in vegetaive parts : much 5 : medium 2.

Inflorescence : number of flowers 3/3, 5/1, 6/2, 9/1.

Calyx : subinflated 1 : cylindric 6 ; anthocyanin much 3 : medium 4.

Corolla colour: W 6 : Y 1 ; petals bilobed 5 : multilobed 2 ; 3/4-lobing 7 ; boss 6 : small scale 1 ; anthocyanin blotch present 3 : absent 4 ; petals not overlapping 7 ; segments not overlapping 7.

Sex : hermaphrodite 4 : hermaphrodite and female 2 : female 1.

Androecium : filaments purple 6 ; anthers purple 6.

Gynoecium : stigmata purple 7 : immature seeds purple 4 : white 3.

Capsules : *S. maritima* type 4.

Mature seeds : weak tubercled 1 : armadillo 3.

Sterility : much.

N. 333=N. 167 plant 28 selfed. 6 plants in the family.

Habit : compact 5 : subcompact 1, spreading and suberect 6 ; overwintering barren shoots some or few and low down, stems up to 3·2 dm.

Surface : all glabrous, all mat.

Leaves : H 6.

Anthocyanin in vegetative parts : much 2 : medium 4.

Inflorescence : number of flowers 3/2, 4/2, 7/2.

Calyx : inflated 2 : subinflated 4 ; anthocyanin medium 5 : little 1.

Corolla colour : W 5 : Y 1 ; petals bilobed 5 : multilobed 1 ; 2/3-lobing 1 : 2/3 to 3/4-lobing 1 : 3/4-lobing 4 ; boss 3 : small scale 2 : scale 1 ; anthocyanin blotch absent 6 ; petals overlapping 1 : not overlapping 5 ; segments overlapping 1 : not overlapping 5.

Sex : hermaphrodite 4 : hermaphrodite and female 2.

Androecium : filaments purple 5 ; anthers purple 5.

Gynoecium : stigmata purple 6 ; immature seeds purple 6.

Capsules : *S. maritima* type 3.

Mature seeds : armadillo 3.

Sterility : very much.

With controlled pollination :

N. 167 plant	Total seeds	Capsules in which seeds contained	Average per capsule
1	88	47	1·87
11	89	71	1·25
28	19	63	0·30

N. 210=*S. glareosa* K. 1094 plant 20 x *S. maritima* S.P.A.70. 66 plants in the family. Under controlled pollination 11 flowers gave 358 seeds.

Habit : all sub-compact with flowering stems ascending ; overwintering barren shoots absent ; stems up to 6·7 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate.

Anthocyanin in vegetaive parts : much 1 : medium 58 : little 7.

Inflorescence : number of flowers 3/1, 5/4, 6/7, 7/40, 8/5, 9/6, 10/2, 11/1.

Calyx : inflated 19 : subinflated 44 : cylindric 3 ; anthocyanin much 4 ; medium 61 : little 1.

Corolla colour : W 34 : X 26 ; petals bilobed 64 : multilobed 2 ; 3/4-lobing 66 ; small scale 49 : scale 17 ; anthocyanin blotch absent 66 ; petals not overlapping 66 ; segments not overlapping 66.

Sex : female 66.

Gynoecium : stigmata purple 66 ; immature seeds purple 66.

Capsules : *S. maritima* type 64.

Mature seeds : weak tubercled 9 : weak armadillo 28 : armadillo 3 : mixed 23.

Sterility : not marked, except in a few plants.

N. 182=*S. glareosa* K. 1099 plant 32 x *S. maritima* S.P.A.70. 40 plants in the family.

Habit : centre compact, flowering branches suberect ; overwintering barren shoots absent except a little green in 8 ; stems up to 3·7 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate.

Anthocyanin in vegetaive parts : medium 40.

Inflorescence : number of flowers 3 to 7, mostly 3.

Calyx : subinflated 39 : cylindric 1 ; anthocyanin medium 40.

Corolla colour : W 6 : X 26 : Y 8 ; petals bilobed 40 ; 3/4-lobing 40 ; Loss 10 : small scale 30 ; anthocyanin blotch present 5 : absent 35 ; petals overlapping 9 : not overlapping 31 ; segments overlapping 10 : not overlapping 30.

Sex : hermaphrodite 40.

Androecium : filaments purple 40 ; anthers purple 40.

Gynoecium : stigmata purple 40 ; immature seeds purple 40.

Capsules : *S. maritima* type 40.

Mature seeds : armadillo 40.

Sterility : not marked.

Selfed to produce F_2 families :

N. 182 plant 2 : calyx subinflated, petals X, small scale, blotch absent, petals overlapping segments not overlapping.

N. 182 plant 19 : calyx subinflated ; petals X, small scale, blotch absent, petals not overlapping, segments not overlapping.

N. 182 plant 25 : calyx subinflated ; petals Y, small scale, blotch absent, petals overlapping, segments overlapping.

N. 327=N. 182 plant 2 selfed. 5 plants in the family.

Habit : compact 2 : subcompact 3, spreading and suberect 5 ; overwintering barren shoots very few and low down ; stems up to 5 dm.

Surface : all glabrous ; all mat.

Leaves : M 5.

Anthocyanin in vegetative parts : much 3 : medium 2.

Inflorescence : Number of flowers 3.

Calyx : inflated 1 : subinflated 3 : cylindric 1 ; anthocyanin much 5.

Corolla colour : W 4 : X 1 ; petals bilobed 5 ; 3/4-lobing 5 ; small scale 5 ; anthocyanin blotch absent 5 ; petals not overlapping 5 ; segments not overlapping 5.

Sex : hermaphrodite 3 : hermaphrodite and female 1 : female 1.

Androecium : filaments purple 4 ; anthers purple 4.

Gynoecium : stigmata purple 5 ; immature seeds purple 4 : white 1.

Capsules : *S. maritima* type 5.

Mature seeds : armadillo 4.

Sterility : much.

N. 325=N. 182 plant 19 selfed. 67 plants in the family.

Habit : compact 51 : subcompact 16, branches spreading and suberect 55 : erect 11 : subprostrate 1 ; overwintering barren shoots 4 present and 14 with little green ; stems up to 4·5 dm.

Surface : all glabrous ; all mat.

Leaves : all of narrow *S. maritima* type.

Anthocyanin in vegetative parts : much 27 : medium 38 : little 1.

Inflorescence : number of flowers 1/1, 2/10, 3/46, 4/1, 5/4, 7/5.

Calyx : inflated 7 : subinflated long 3 : subinflated 29 : long cylindric 16 : cylindric 12 ; anthocyanin much 22 : medium 33 : little 11.

Corolla colour : W 40 : X 23 ; petals bilobed 64 : multilobed 3 ; 1/2-lobing 1 : 1/2 to 3/4-lobing 1 : 2/3 to 3/4-lobing 2 : 3/4-lobing 63 ; boss 8 : boss to small scale 2 : small scale 49 : scale 8 ; anthocyanin blotch absent 66 ; petals overlapping 12 : not overlapping 54 ; segments overlapping 9 : not overlapping 57.

Sex : hermaphrodite 47 : hermaphrodite and female 11 : female 9.

Androecium : filaments purple 57 ; anthers purple 58.

Gynoecium : stigmata purple 61 : white 5 ; immature seeds purple 54 : white 10.

Capsules : *S. maritima* type 55.

Mature seeds : armadillo 58.

Sterility : marked, except in a few plants.

N. 326=N. 182 plant 25 selfed. 5 plants in the family.

Habit : compact 3 : subcompact 2, spreading and suberect 4 : subprostrate 1 ; overwintering barren shoots absent ; stems up to 4 dm.

Surface : all glabrous ; all mat.

Leaves : M 4 : M H 1.

Anthocyanin in vegetative parts : much 2 : medium 3.

Inflorescence : number of flowers 3/1, 4/2, 6/1, 7/1.

Calyx : inflated 1 : cylindric 4 ; anthocyanin much 1 : medium 4.

Corolla colour : W 3 : X 2 ; bilobed 4 : multilobed 1 ; 3/4-lobing 5 ; scale 3 : small scale 2 ; anthocyanin blotch present 1 : absent 4 ; petals overlapping 2 : not overlapping 3 ; segments overlapping 1 : not overlapping 4.

Sex : hermaphrodite 2 : hermaphrodite and female 2 : female 1.

Androecium : filaments purple 4 ; anthers purple 4.

Gynoecium : stigmata purple 4 : white 1 ; immature seeds purple 4 : white 1.

Capsules : *S. maritima* type 3.

Mature seeds : armadillo 2.

Sterility : much.

With controlled pollination :

N. 182 plant	Total seeds	Capsules in which seeds contained	Average per capsule
2	49	68	0·72
19	353	58	6·09
25	17	68	0·25

The families dealt with in this section are :

N. 163=K. 1099 plant 32 x S.P.A.20.

N. 330=N. 163 plant 23 selfed.

N. 167=K. 1099 plant 32 x S.P.A.68.

N. 334=N. 167 plant 1 selfed.

N. 331=N. 167 plant 11 selfed.

N. 333=N. 167 plant 28 selfed.

N. 210=K. 1094 plant 20 x S.P.A. 70.

N. 182=K. 1099 plant 32 x S.P.A.70.

N. 327=N. 182 plant 2 selfed.

N. 325=N. 182 plant 19 selfed.

N. 326=N. 182 plant 25 selfed.

In the results, points to be particularly noted are :

1. *Winter condition.* Some undoubted indications of intermediate development with segregation.

2. *Anthocyanin in vegetative parts and calyx* gave medium from crossing, in N. 163, of plants with much in vegetative parts and medium in calyx and with none in both. In F_2 there was clear-cut segregation in the ratio much 2 : medium 1 : none 1 in vegetative parts and much 1 : medium 2 : none 1 in calyx.

3. *Leaf shape.* All F_1 families were intermediate. Summated F_2 families gave M 81 : H M 6 : M H 16 : H 15 (M=of *S. maritima* type, H=of hybrid type).

4. *Number of flowers.* These were mostly 3 to 7 (rarely to 9 or 11).

5. *Calyx shape.* The results may be tabulated as follows :

N. 163.	N x 1
F_1	S 47 : N 20
F_2	S 4
N. 167	N x N
F_1	S 10 : N 21
F_2 (from S)	I 2 : S 4
F_2 (from N)	S 7 : N 17
F_2 (from N)	S 1 : N 6
N. 210	I x L
F_1	I 19 : S 44 : N 3
N. 182	N x L
F_1	S 39 : N 1

F_2s (from S), summated, I 7 : S L 3 : S 29 : L N 16 : N 12.

[I=inflated, S=subinflated, N=narrow, L=long narrow].

6. *Petal colour.*

N. 210=X x W

F_1	W 34 : X 26

F_1s of Y x W summated gave : W 10 : X 108 : Y 20
F_2s from Y x W summated gave : W 66 : X 44 : Y 4.

7. *Sex.*	H x H F
F_1	H 67
F_2	H 1 : H F 1 : F 2
	H x H F
F_1	H 31
F_2s	H 18 : H F 7 : F 12
	F x H
F_1	F 66
	H x H
F_1	H 40
F_2	H 52 : H F 14 F 11.

8. *Seeds.* All plants had armadillo seeds in N. 163, N. 167, and N. 182 and in derived F_2 families, except for one plant in N. 331 with weak tubercled seeds. In N. 210 there was segregation within the range of the parents, but with somatic differentiation in 23 plants.

9. *Capsules* were all of *S. maritima* type.

10. *Sterility.* There was much to very much in all families except N. 210 and N. 182, where it only occurred in a few plants, both F_1 families. It was marked in all F_2 families.

ix. CROSSES INVOLVING S. ALPINA AND S. MARITIMA.

N. 162—*S. alpina* K. 1085 plant 5 x *S. maritima* S.P.A.20. 68 plants in the family.

Habit : centre compact, flowering stems spreading and ascending ; all died down but 12 showed a little green ; stems up to 4 dm.

Surface : stems, hairs medium 3 : few 15 : glabrous 50 ; leaves, hairs dense 2 : medium 12 : few 11 : glabrous 43 ; all mat.

Leaves : approximately intermediate.

Anthocyanin in vegetative parts : medium 68.

Inflorescence : number of flowers 1 to 7, mostly 3.

Calyx : inflated 42 : subinflated 26 ; anthocyanin medium 68.

Corolla colour : W 26 : X 40 : Y 2 ; petals bilobed 47 : multilobed 21 ; 3/4-lobing 68 ; boss 33 : small scale 35 ; anthocyanin blotch present 37 : absent 31 ; petals overlapping 44 : not overlapping 24 ; segments overlapping 54 : not overlapping 14.

Sex : hermaphrodite 57 : hermaphrodite and female 4 : female 7.

Androecium : filaments purple 58 : white 3 ; anthers purple 61.

Gynoecium : stigmata purple 68 ; immature seeds purple 67.

Capsules : *S. maritima* type 58.

Mature seeds : armadillo 59.

Sterility : very considerable.

Characters of *S. maritima* parents :

S.P.A. 20 : leaves linear to narrowly linear-lanceolate, no anthocyanin in vegetative parts, calyx inflated with no anthocyanin, petals and segments scarcely contiguous bilobed 3 4-lobing small scale no blotch, hermaphrodite and female, filaments white, stigmata white, immature seeds purple, *S. maritima* type capsules, seeds armadillo.

S.P.A.68 : leaves linear or narrowly lanceolate- or oblanceolate-linear, much anthocyanin in vegetative parts, calyx cylindric with much anthocyanin, petals white multilobed 3/4-lobing scale blotch present petals and segments not overlapping, hermaphrodite and female, filaments, anthers, stigmata, and immature seeds purple, *S. maritima* type capsule, seeds armadillo (see Journ. Ecol. **26,** 365 : 1938, for fuller description).

S.P.A.70 : leaves linear to oblanceolate linear, much anthocyanin in vegetative parts, calyx long cylindric with medium anthocyanin, petals white 3/4-lobing small scale no blotch petals more or less not overlapping, segments overlapping, hermaphrodite, filaments, anthers, stigmata, and seeds purple, *S. maritima* type capsules seeds armadillo (see K.B. 1939, 298, for fuller description).

For K. 1085 plant 5 ; K. 1085 plant 13 ; K. 1085 plant 24 ; K. 1099 plant 32 see earlier part (selfings of *S. alpina* and *S. glareosa*).

Selfed to produce F_2 families :

N. 162 plant 23 : stem hairs few, leaf hairs medium, calyx subinflated, petals X, bilobed small scale no blotch not overlapping, segments overlapping, hermaphrodite, filaments purple.

N. 162 plant 64 : stem glabrous, leaf hairs few, calyx inflated, petals Y multilobed small scale no blotch overlapping, segments overlapping, hermaphrodite, filaments purple.

N. 323=N. 162 plant 23 selfed. 9 plants in the family.

Habit : all compact, suberect 5 : subprostrate 3 ; no overwintering shoots 6 : few green shoots and these low down 3 ; stems up to 2·3 dm.

Surface : stem and leaves, hairs few 2 : glabrous 7 ; all mat.

Leaves : M 7 : H M 2.

Anthocyanin in vegetative parts : much 3 : none 6.

Inflorescence : number of flowers 1/1, 2/1, 3/6.

Calyx : inflated 3 : subinflated 5 ; anthocyanin much 2 : medium 1 : none 5.

Corolla colour : W 5 : X 3 ; petals bilobed 8 ; 1/2-lobing 1 : 2/3-3/4-lobing 3 : 3/4-lobing 4 ; boss 6 : small scale 2 ; anthocyanin blotch present 1 : absent 7 ; petals not overlapping 7 ; segments overlapping 1 : not overlapping 6.

Sex : hermaphrodite 1 : hermaphrodite and female 3 : female 4.

Androecium : filaments purple 1 : white 3 ; anthers purple 3.

Gynoecium : stigmata purple 3 : white 5 ; immature seeds purple 8.

Capsules : *S. maritima* type 2.

Mature seeds : armadillo 3.

Sterility : very great.

N. 332=N. 162 plant 64 selfed. 4 plants in the family.

Habit : centre compact 4, flowering stems spreading and subprostrate 4 ; no overwintering barren shoots ; stems up to 2·4 dm.

Surface : all glabrous ; all mat.

Leaves : M 3 : HM 1.

Anthocyanin in vegetative parts : medium 1 : none 3.

Inflorescence : number of flowers 1/2, 2/1, 3/1.

Calyx : inflated 1 : subinflated 3 ; anthocyanin medium 1 : none 3.

Corolla colour : W 3 : X 1 ; petals bilobed 1 : multilobed 3 ; 2/3–3/4-lobing 1 : 3/4-lobing 3 ; boss 2 : small scale 2 ; anthocyanin blotch absent 4 ; petals overlapping 1 : not overlapping 3 ; segments not overlapping 4.

Sex : hermaphrodite and female 1 : female 3.

Androecium : filaments purple 1 ; anthers purple 1.

Gynoecium : stigmata purple 1 : white 3 ; immature seeds purple 4.

Capsules : *S. maritima* type 3.

Mature seeds : armadillo 3.

Sterility : very considerable.

With controlled pollination :

N. 162 plant	Total seeds	Capsules in which seeds contained	Average per capsule
23 selfed	142	49	2·90
64 selfed	50	60	0·83
4 selfed	0	32	0
27 selfed	40	26	1·54

N. 168=*S. alpina* K. 1085 plant 24 x *S. maritima* S.P.A.68. 70 plants in the family.

Habit : centre compact, flowering stems spreading and ascending ; all died down except 5 which showed a little green ; stems up to 3 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate.

Anthocyanin in vegetative parts : much 70.

Inflorescence : number of flowers 1–3.

Calyx : inflated 1 : subinflated 62 : cylindric 7 ; anthocyanin medium 70.

Corolla colour : W 26 : X 42 : Y 2 ; petals bilobed 67 : multilobed 3 ; 3/4-lobing 70 ; boss 51 : small scale 19 ; anthocyanin blotch present 45 : absent 25 ; petals overlapping 33 : not overlapping 37 ; segments overlapping 27 : not overlapping 43.

Sex : hermaphrodite 63 : hermaphrodite and female 2 : female 5.

Androecium : filaments purple 65 ; anthers purple 65.

Gynoecium : stigmata purple 70 ; immature seeds purple 70.

Capsules : *S. maritima* type 69.

Mature seeds : armadillo 46 : weak armadillo 14 : armadillo and weak armadillo 9.

Sterility : no marked sterility except in a few plants.

Selfed to produce F_2 families :

N. 168 plant 64 : calyx subinflated, petals Y bilobed small scale blotch present overlapping, segments not overlapping, hermaphrodite, seeds armadillo.

N. 168 plant 68 : calyx cylindric, petals X bilobed small scale blotch present overlapping, segments overlapping, hermaphrodite, seeds armadillo.

N. 105=S.P.A.68 selfed. 91 plants in the family.

Habit, *leaves*, and *inflorescence* as in parent.

Calyx : inflated 1 : cylindric 90 ; anthocyanin very much 4 : much 40: medium 45 : little 2.

Corolla colour : pink (upper and lower surface Laelia Pink, lower surface veined Tourmaline Pink) 1 : white 90 ; petals bilobed 69 : multilobed 22 ; 3/4-lobing 91 ; small scale 27 : scale 64 ; anthocyanin blotch present 87 : absent 4 ; petals overlapping 81 : not overlapping 11 ; segments overlapping 46 : not overlapping 45.

Sex : hermaphrodite 58 : hermaphrodite and female 18 : female 14.

Androecium : filaments purple 49 : white 24 ; anthers purple 73.

Gynoecium : stigmata purple 69 : white 22 ; immature seeds purple 89.

Capsules : all *S. maritima* type.

Seeds : all armadillo.

N. 340=N. 168 plant 64 selfed. 10 plants in the family.

Habit : centre compact, flowering stems spreading and suberect 5 : spreading and subprostrate 5 ; some overwintering green shoots ; stems up to 2·4 dm.

Surface : all glabrous : all mat.

Leaves : HM 6 ; H 4.

Anthocyanin in vegetative parts : very much 7 : much 2 : medium 1.

Inflorescence : number of flowers 1/1, 2/1, 3/8.

Calyx : inflated 3 : subinflated 6 : cylindric 1 ; anthocyanin medium 6 : much 4.

Corolla colour : X 9 : Y 1 ; petals bilobed 10 ; 2/3-lobing 2 : 3/4-lobing 8 ; boss 9 : small scale 1 ; anthocyanin blotch present 2 : absent 8 ; petals overlapping 1 : not overlapping 8 ; segments overlapping 5 : not overlapping 5.

Sex : hermaphrodite 1 : hermaphrodite and female 1 : female 8.

Androecium : filaments purple 2 : white 1 ; anthers purple 2.

Gynoecium : stigmata purple 6 : white 4 ; immature seeds purple 10.

Capsules : *S. maritima* type 7.

Mature seeds : armadillo 3 : weak armadillo 5.

Sterility : fair amount.

N. 329=N. 168 plant 68 selfed. 13 plants in the family.

Habit : centre compact, flowering stems spreading and suberect 11 : spreading and subprostrate 2 ; with very few green overwintering shoots low down 8 ; stems up to 3 dm.

Surface : all glabrous ; all mat.

Leaves : HM 1 : MH 3 : H 9.

Anthocyanin in vegetative parts : very much 11 : much 2.

Inflorescence : number of flowers 3/12, 5/1.

Calyx : subinflated 6 : cylindric 7 ; anthocyanin medium 13.

Corolla colour : W 5 : X 8 ; petals bilobed 10 : multilobed 3 ; 2/3 to 3/4-lobing 1 : 3/4-lobing 12 : boss 8 : boss to small scale 1 : small scale 4 ; anthocyanin blotch present 9 : absent 4 ; petals not overlapping 13 ; segments overlapping 7 : not overlapping 6.

Sex : hermaphrodite 11 : hermaphrodite and female 2.

Androecium : filaments purple 13 ; anthers purple 13.

Gynoecium : stigmata purple 11 : white 2 ; immature seeds purple 13.

Capsules : *S. maritima* type 8.

Mature seeds : armadillo 8 : weak armadillo 1.

Sterility : marked.

With controlled pollination :

N. 168 plant	Total seeds	Capsules in which seeds contained	Average for capsule
64 selfed	71	26	2·73
68 selfed	40	17	2·35

N. 176=*S. alpina* K. 1085 plant 13 x *S. maritima* S.P.A.70. 70 plants in the family.

Habit : centre compact, flowering stems somewhat spreading and suberect ; died down in winter but 19 showed a little green ; stems up to 3 dm.

Surface : hairs on stems dense 31 : medium 17 : few 2 : glabrous 20 ; hairs on leaves dense 49 : few 20 : glabrous 1 ; all mat.

Leaves : an obvious range in leaf shape from near to K. 1085 plant 13 to near to S.P.A.70.

Anthocyanin in vegetative parts : much 70.

Inflorescence : number of flowers 1 to 3.

Calyx : inflated 5 : subinflated 64 : cylindric 1 ; anthocyanin medium 70.

Corolla colour : W 60 : X 10 ; bilobed 70 ; 3/4-lobing 70 ; small scale 69 : scale 1 ; anthocyanin blotch present 31 : absent 39 ; petals overlapping 19 : not overlapping 51 ; segments overlapping 67 : not overlapping 3.

Sex : hermaphrodite 69 : hermaphrodite and female 1.

Androecium : filaments purple 70 ; anthers purple 70.

Gynoecium : stigmata purple 70 ; immature seeds purple 70.

Capsules : *S. maritima* type 70.

Mature seeds : tubercled 20 : weak tubercled 7 : armadillo 32 : weak armadillo 4 : mixtures 7. In plants 34 and 39 all 4 types of seeds were present in single capsules.

Sterility : no general sterility.

Selfed to produce F_2 families :
N. 176 plant 6 : hairs on stems and leaves dense, leaf shape near to K. 1085 plant 13, calyx inflated, petals X small scale blotch present overlapping, segments overlapping, hermaphrodite, seeds tubercled.

N. 328=N. 176 plant 6 selfed. 8 plants in the family.

Habit : compact 5 : subcompact 2 : subspreading 1 ; flowering stems spreading and suberect 8 ; overwintering barren shoots present in good numbers 2 : very few and low down 6 ; stems up to 3·6 dm.

Surface : hairs on stems dense 1 : medium 4 : glabrous 3 ; hairs on leaves dense 4 : medium 1 : glabrous 3 ; all mat.

Leaves : HM 1 : MH 1 : H 1 : AH 4 : HA 1.

Anthocyanin in vegetative parts : much 5 : medium 3.

Inflorescence : number of flowers 1/1, 2/1, 3/4, 7/2.

Calyx : very inflated 1 : inflated 3 : subinflated 4 ; anthocyanin much 1 : medium 6 : little 1.

Corolla colour : W 6 : X 2 ; petals bilobed 6 : multilobed 2 ; 2/3-lobing 1 : 3/4-lobing 7 ; small scale 4 : scale 4 ; anthocyanin blotch present 4 : absent 4 ; petals overlapping 3 : not overlapping 5 ; segments overlapping 4 : not overlapping 4.

Sex : hermaphrodite 3 : hermaphrodite and female 1 : female 4.

Androecium : filaments purple 4 ; anthers purple 4.

Gynoecium : stigmata purple 8 ; immature seeds purple 8.

Capsules : *S. maritima* type 5.

Mature seeds : tubercled 2 : armadillo 2.

Sterility : considerable.

With controlled pollination of 28 flowers, 76 seeds were set, an average of 2·72 per capsule.

The families dealt with in this section are :

N. 162=K. 1085 plant 5 x S.P.A.20.

N. 323=N. 162 plant 23 selfed.

N. 332=N. 162 plant 64 selfed.

N. 168=K. 1085 plant 24 x S.P.A.68.

N. 105=S.P.A.68 selfed.

N. 340=N. 168 plant 64 selfed.

N. 329=N. 168 plant 68 selfed.

N. 176=K. 1085 plant 13 x S.P.A.70.

N. 328=N. 176 plant 6 selfed.

In the results, points to be particularly noted are :

1. *Winter condition.* *S. alpina* and *S. glareosa* resemble *S. vulgaris* in this respect and contrast with *S. maritima.* Most F_1 and F_2 families showed some green shoots but these were low down. There was some suggestion of an intermediate development of the character.

2. *Anthocyanin in vegetative parts.* In N. 162, medium x none gave medium which on selfing segregated into (a) much and none and (b) medium and none in different F_2 families. In N. 168, much x much gave much which on selfing gave (a) very much, much, and medium and (b) very much and much in different F_2 families. The *S. maritima* parent on selfing gave very much, much, medium, and little.

3. *Indumentum.* Hairs, when present, were of the short bristly type and the genes responsible for indumentum were introduced by *S. alpina*, all three *S. maritima* parents being quite glabrous. Families N. 332, N. 168, N. 340, and N. 329 had only glabrous plants. The remaining F_1 and F_2 families segregated, as was to be expected.

4. *Leaf shape.* Using the symbols M for *S. maritima* parental type, A for *S. alpina* parental type, and H for hybrid (F_1) type results were obtained as follows :

N. 162		A x M
	F_1	H
	F_2	M 7 : HM 2
	F_2	M 3 : HM 1
N. 168		A x M
	F_1	H
	F_2	HM 6 : H 4
	F_2	HM 1 : MH 3 : H 9
N. 176		A x M
	F_1	range in family ; HA type selfed
	F_2	HM 1 : MH 1 : H 1 : AH 4 : HA 1

5. Flower number throughout was low and ranged from 1 to 7

6. The crossings involved plants with inflated (I), subinflated (S), narrow or cylindric (N), or long cylindric (L) calyces, and gave the following results :

N. 162		S x I
	F_1	I 42 : S 26
	F_2s	I 1 : S 3 ; I 3 : S 5
N. 168		I x N
	F_1	I 1 : S 62 : N 7
	F_2s	I 3 : S 6 : N 1 ; S 6 : N 7
N. 176		S x L
	F_1	I 5 : S 64 N 1
	F_2	+I 1 : I 3 : S 4

7. *Petal colour*

N. 162 X x W
F_1 W 26 : X 40 : Y 2
F_2s W 5 : X 3 ; W 8 : X 1

N. 168 X x W
F_1 W 26 : X 42 : Y 2
F_2s W 5 : X 8 ; X 9 : Y 1

N. 176 X x W
F_1 W 60 : X 10
F_2 W 6 : X 2

8. Sex.

N. 162 HF x HF
F_1 H 57 : HF 4 : F 1
F_2 H 1 : HF 3 : F 4
F_2 HF 1 : F 3

N. 168 H x HF
F_1 H 63 : HF 2 : F 5
F_2 H 1 : HF 1 : F 8
F_2 H 11 : HF 2

N. 176 H x H
F_1 H 69 : HF 1
F_2 H 3 : HF 4.

9. All plants had armadillo seeds in N. 162, N. 323, and N. 332. In British and much continental material of *S. vulgaris* and *S. maritima*, and in crosses between these two species, armadillo is recessive to tubercled. Some factors modifying these characters have, however, been recorded. In some of the wide interspecific crosses which are dealt with here the simple monohybrid Mendelian scheme breaks down. Sometimes different types of seeds occur in the same capsule. As the characters are those of the testa this must involve a kind of somatic differentiation. How far this is the result of introducing a genom into cytoplasm strange to it (through crossing between species having different and not overlapping geographical ranges) remains an open question.

10. Capsules throughout are all of *S. maritima* type.

11. Sterility was marked or considerable in N. 162 and all F_2 families, except N. 168 and N. 176.

X. CROSSES INVOLVING S. GLAREOSA AND S. VULGARIS.

N. 208=*S. glareosa* K. 1094 plant 20 x *S. vulgaris* N. 12 plant 219. 46 plants in the family. Under controlled pollination 11 flowers produced 536 seeds.

Habit : centre loose, subprostrate, ends ascending subspreading ; all died down ; stems up to 7·3 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate.

Anthocyanin in vegetative parts : medium 42 : little 4.

Inflorescence : number of flowers 11/1, 14/1, 15/1, 16/3, 18/1, 19/2, 21/3, 22/6, 23/4, 24/3, 25/3, 27/3, 28/2, 29/3, 31/1, 33/1, 35/3, 37/2, 39/1, 40/1.

Calyx : inflated 13 : subinflated 33 ; anthocyanin medium 46.

Corolla : W 27 : X 19 ; petals bilobed 46 ; 3/4-lobing 46 ; boss 16 : small scale 29 : scale 1 ; anthocyanin blotch present 4 : absent 39 ; petals and segments not overlapping.

Sex : hermaphrodite 13 : female 31.

Androecium : filaments and anthers purple 13.

Gynoecium : stigmata purple 44 ; immature seeds purple 44.

Capsules : hybrid type 33 : mixtures of *S. maritima*, *S. vulgaris*, and hybrid types 13.

Mature seeds : armadillo 26 : mixtures of armadillo, weak armadillo, and weak tubercled 13.

Sterility : not marked.

K. 1094 plant 20 : glabrous, medium anthocyanin in vegetative parts, little in calyx, calyx subinflated, petals X bilobed 3/4-lobing small scale blotch absent not overlapping, segments not overlapping, female, stigmata and immature seeds purple, capsules *S. maritima* type, seeds armadillo.

N. 12 plant 219 : anthocyanin in vegetative parts and calyx, few hairs, calyx subinflated, petals W bilobed 3/4-lobing boss blotch absent not overlapping, segments not overlapping, hermaphrodite, filaments white, anthers purple, stigmata white, immature seeds purple, capsules *S. vulgaris* type, seeds weak armadillo. (See *K.B.* 1931, p. 348).

N. 196=N. 12 plant 219 x K. 1095 plant 14. 67 plants in the family. Under controlled selfing 4 flowers gave 170 seeds.

Habit : centre subcompact, branches subspreading and suberect ; all died down in the winter ; stems up to 5·4 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate but verging to K. 1095 plant 14, uniform.

Anthocyanin in vegetative parts : medium 67.

Inflorescence : up to 15 flowers.

Calyx : inflated 2 : subinflated 65 ; anthocyanin medium 67.

Corolla : W 46 : X 16 : Y 5 ; bilobed 67 ; 3/4-lobing 67 ; boss 67 ; anthocyanin blotch present 24 : absent 43 ; petals and segments not overlapping 67.

Sex : hermaphrodite 51 : female 16.

Androecium : filaments and anthers purple 51.

Gynoecium : stigmata purple and immature seeds purple 67.

Capsules : *S. maritima* type 3 : hybrid type 64.

Seeds : weak tubercled 9 : weak armadillo 19 : armadillo 39.

No sterility.

N. 196 plant 7 had calyx subinflated, petals W, blotch absent, hermaphrodite flowers, capsules of hybrid type, seeds armadillo.

N. 196 plant 2 had calyx inflated, petals X, blotch present, hermaphrodite flowers, capsules of hybrid type, seeds weak armadillo.

N. 350=N. 196 plant 7 selfed. 21 plants in the family.

Habit : stems up to 4·5 dm.

Anthocyanin in vegetative parts : medium 20 : little 1.

Surface : all glabrous (except No. 18 with few hairs on stems).

Leaves : F_1 type 5 : *S. glareosa* type 9 : smaller and narrower than grandparents 5. No plant had leaves verging from F_1 type towards the *S. vulgaris* grandparent. On the other hand, 5 plants had smaller and narrower leaves than the *S. glareosa* grandparent.

Inflorescence : number of flowers 2/1, 3/1, 5/1, 7/10, 9/1, 13/1.

Calyx : subinflated 16 ; anthocyanin medium 3 : little 13.

Corolla : W 13 ; petals bilobed 13, 3/4-lobing 13, boss 13, blotch absent 13, petals and segments not overlapping 13.

Sex : hermaphrodite 8 : hermaphrodite and female 5.

Androecium : filaments purple 10 : white 3 ; anthers purple 12 : yellow-green 1.

Gynoecium : stigmata purple 10 : white 4 ; immature seeds purple 11 : white 2.

Capsules : *S. maritima* type 6 : hybrid type 4 : *S. vulgaris* type 1.

Seeds : armadillo 11.

Sterility very marked.

N. 358=N. 196 plant 2 selfed. 19 plants in the family.

Habit : stems up to 5·0 dm.

Anthocyanin in vegetative parts : much 6 : medium 13.

Surface : all glabrous.

Leaves : F_1 type 3 : *S. glareosa* type 8 : smaller and narrower 7 : verging from F_1 a little towards *S. vulgaris* 1.

Inflorescence : number of flowers 3/3, 5/1, 6/1, 7/4, 9/2, 12/2, 15/1.

Calyx : subinflated 14 ; anthocyanin medium 5 : little 9.

Corolla : W 8 : X 5 : Y 1 ; petals bilobed 14, 3/4-lobing 14, boss 14, blotch present 4 : absent 10, petals and segments not overlapping 14.

Sex : hermaphrodite 11 : female 3.

Androecium : filaments purple 8 : white 3 ; anthers purple 11.

Gynoecium : stigmata purple 9 : white 4 ; immature seeds purple 10.

Capsules : *S. maritima* type 1 : F_1 type 10 : *S. vulgaris* type 1.

Seeds : weak armadillo 6 : armadillo 7.

Sterility very marked.

N. 174=N. 12 plant 219 x K. 1094 plant 52. 52 plants in the family.

Habit : centre subcompact, branches suberect ; all died down in winter ; stems up to 9·5 dm.

Surface : all glabrous ; all mat.

Leaves : intermediate, but verging towards K. 1094 plant 52.

Anthocyanin in vegetative parts : much 52.

Inflorescence : number of flowers 10/1, 11/1, 12/1, 13/12, 15/11, 16/1, 17/3, 18/3, 19/3, 21/5, 22/3, 23/2, 25/4, 26/1, 31/1.

Calyx : subinflated 52 ; anthocyanin little 52.

Corolla : W 13 : X 22 : Z 2 ; petals bilobed 37 ; 3/4-lobing 37 ; small scale 18 : boss 19 ; anthocyanin blotch present 3 ; absent 10 ; petals overlapping 23 : not overlapping 14 ; segments not overlapping 37.

Sex : hermaphrodite 31 : female 5.

Androecium : filaments and anthers purple 31.

Gynoecium : stigmata purple 30 : white 7 ; immature seeds purple 52.

Capsules : *S. maritima* type 8 : hybrid type 44.

Seeds : tubercled 9 : weak tubercled 6 : weak armadillo 17 : armadillo 20.

No sterility with open pollination.

With controlled self-pollination :

N. 174 plant	Total seeds	Capsules in which seeds contained	Average per capsule
22	146	10	14·6

N. 174 plant 1 had petals W, small scale, blotch present, petals overlapping, hermaphrodite flowers, stigmata purple, capsules of hybrid type, seeds weak armadillo.

N. 174 plant 52 had petals X, small scale, petals not overlapping, hermaphrodite flowers, stigmata purple, capsules of hybrid type, seeds armadillo.

N. 174 plant 22 had capsules of *S. maritima* type, seeds weak armadillo.

N. 357=N. 174 plant 1 selfed. 39 plants in the family.

Habit : centre subcompact, stems nearly erect or slightly ascending ; stems up to 4·5 dm.

Anthocyanin in vegetative parts : all medium.

Surface : all glabrous ; mat 33 : shining green 6.

Leaves : ranging from F_1 type to *S. glareosa* type.

Inflorescence : number of flowers up to 18.

Calyx : all subinflated ; anthocyanin medium 12 : little 25. No. 13 had a very small calyx.

Corolla : W 37 ; petals bilobed 37, 3/4-lobing 37, small scale 8 : boss 29, blotch present 1 : absent 36, petals and segments not overlapping 37.

Sex : hermaphrodite 20 : female 17.

Androecium : filaments purple 17 : white 3 ; anthers purple 20.

Gynoecium : stigmata purple 24 : white 13 ; immature seeds purple 7 : white 17.

Capsules : *S. maritima* type 2 : hybrid type 19.

Seeds : weak armadillo 16 : armadillo 12.

Very marked sterility.

N. 362=N. 174 plant 52 selfed. 16 plants in the family.

Habit : centre compact 2 : subcompact 9 : loose 5 ; branches erect 2 : suberect 5 : subprostrate 9 ; stems up to 4·5 dm.

Anthocyanin in vegetative parts : much 5 : medium 10 : little 1.

Indumentum : all glabrous ; mat 12 : shining green 4.

Leaves : *S. glareosa* type 7 : F_1 type 9.

Inflorescence : number of flowers 3/2, 7/7, 9/4, 11/1, 13/1, 17/1.

Calyx : subinflated 16 ; anthocyanin medium 2 : little 14.

Corolla : W 6 : X 3 : Y 6 : Z 1 ; petals bilobed 16, 3/4-lobing 15 : 2/3-lobing 1, boss 16, blotch present 4 : absent 12, petals and segments not overlapping 16.

Sex : hermaphrodite 13 : female 3.

Androecium : filaments purple 7 : white 5 ; anthers purple 10 : yellow-green 2.

Gynoecium : stigmata purple 6 : white 10 ; immature seeds purple 6 : white 4.

Capsules : hybrid type 5 : *S. vulgaris* type 4.

Seeds : armadillo 15.

Sterility very marked.

N. 367=N. 174 plant 22 selfed. 3 plants in the family.

Habit : centre subcompact 2 : loose 1 ; branches ascending 2 : prostrate 1 ; stems up to 4·0 dm.

Anthocyanin in vegetative parts : medium 2 : little 1.

Surface : glabrous 3 ; mat 3.

Leaves : F_1 type 3.

Inflorescence : number of flowers 3/1, 7/1, 11/1.

Calyx : inflated 1 : subinflated 2 ; anthocyanin medium 1 : little 2.

Corolla : X 2 : Y 1 ; petals bilobed 3, 3/4-lobing 3, boss 3, blotch present 1 : absent 2, petals and segments not overlapping 3.

Sex : female 3.

Gynoecium : stigmata purple 3.

Capsules : *S. maritima* type 1.

Seeds : weak armadillo 2.

Sterility very marked.

N. 171=*S. glareosa* K. 1094 plant 11 x *S. vulgaris* N. 37 plant 3. 35 plants in the family.

Habit : centre subcompact, branches suberect ; all died down in winter ; stems up to 5·7 dm.

Surface : stems medium 8 : few 9 : glabrous 18 ; leaves dense 8 : medium 14 : few 6 : glabrous 7 ; all mat.

Leaves : intermediate and uniform.

Anthocyanin in vegetative parts : much 1 : medium 27 : little 6.

Inflorescence : Up to 20 flowers.

Calyx : inflated 2 : subinflated 33 ; anthocyanin medium 28 : little 7.

Corolla : W 30 : X 5 ; bilobed 35 ; 3/4-lobing 35 ; boss 35 ; anthocyanin blotch present 4 : absent 31 ; petals and segments not overlapping 35.

Sex : hermaphrodite 21 : hermaphrodite and female 1 : female 13.

Androecium : filaments and anthers purple 22.

Gynoecium : stigmata purple 35 ; immature seeds purple 29 : white 6.

Capsules : *S. maritima* type 6 : hybrid type 26 : *S. vulgaris* type 2.

Seeds : tubercled 19 : tubercled and weak tubercled 3 : weak tubercled and weak armadillo 13.

Sterility patchy with open pollination.

With controlled self-pollination :

N. 171 plant	Total seeds	Capsules in which seeds contained	Average per capsule
7	156	54	2·89

N. 37 plant 3 had little anthocyanin in the vegetative parts which were mat, dense indumentum, inflated calyx with little anthocyanin, petals white bilobed 3/4-lobing no blotch boss petals and segments not overlapping, hermaphrodite flowers, filaments and anthers purple, stigmata white, immature seeds purple, capsules *S. vulgaris* type, seeds tubercled.

N. 171 plant 7 had stems glabrous leaves few hairs, anthocyanin in vegetative parts medium, calyx subinflated with medium anthocyanin, petals X, blotch present, hermaphrodite flowers, immature seeds purple, capsules of hybrid type, seeds weak tubercled and weak armadillo.

N. 171 plant 8 had indumentum on stems and leaves medium, anthocyanin in vegetative parts little, calyx inflated with little anthocyanin, petals W, blotch absent, hermaphrodite flowers, immature seeds purple, capsules of hybrid type, seeds tubercled.

N. 344=N. 171 plant 7 selfed. 24 plants in the family.

Habit : subcompact 23 : loose 1, branches ascending 6 : suberect 18 ; stems up to 6·0 dm.

Anthocyanin in vegetative parts : much 1 : medium 21 : little 2.

Surface : stems medium 1 : few 2 : glabrous 21 ; leaves medium 2 : few 2 : glabrous 20 ; all mat.

Leaves : F_1 type 5 : *S. glareosa* type 17 : narrower 1 : verging from F_1 towards *S. vulgaris* 1.

Inflorescence : number of flowers 3/2, 5/2, 7/9, 10/1, 12/2, 13/3, 14/1, 15/1, 18/1, 19/1.

Calyx : subinflated 23 ; anthocyanin medium 11 : little 12.

Corolla : W 16 : X 6 ; petals bilobed 23, 3/4-lobing 23, boss 23, blotch absent 23, petals and segments not overlapping.

Sex : hermaphrodite 17 : hermaphrodite and female 1 : female 5.

Androecium : filaments purple 14 : white 4 ; anthers purple 18.

Gynoecium : stigmata purple 17 : white 6 ; immature seeds white 17.

Capsules : *S. maritima* type 2 : hybrid type 12.

Seeds : tubercled 2 : weak tubercled 1 : weak tubercled to weak armadillo 5 : weak armadillo 7.

Sterility very marked.

N. 349=N. 171 plant 8 selfed. 7 plants in the family.

Habit : centre compact 1 : loose 6, branches suberect 4 : subprostrate 3 ; stems up to to 5·0 dm.

Anthocyanin in vegetative parts : much 2 : medium 5.

Surface : stems medium 3 : few 1 : glabrous 3 ; leaves dense 2 : medium 1 : few 2 : glabrous 2 ; all mat.

Leaves : F_1 type 4 : *S. glareosa* type 3.

Inflorescence : number of flowers 5/1, 6/1, 7/2, 8/1, 9/1, 18/1.

Calyx : subinflated 6 ; anthocyanin little 6 : none 1.

Corolla : W 6 : Marguerite Yellow 1 ; petals bilobed 7, 3/4-lobing 7, boss 7, blotch absent 7, petals and segments not overlapping 7.

Sex : hermaphrodite 4 : female 3.

Androecium : filaments purple 4 ; anthers purple 3 : yellow-green 1.

Gynoecium : stigmata purple 5 : white 2 ; immature seeds white 1.

Capsules : hybrid type 3.

Seeds : weak tubercled 3.

Very great sterility.

The families dealt with in this section are :

N. 208=K. 1094 plant 20 x N. 12 plant 219.

N. 196=N. 12 plant 219 x K. 1095 plant 14.

N. 350=N. 196 plant 7 selfed.

N. 358=N. 196 plant 2 selfed.

N. 174=N. 12 plant 219 x K. 1094 plant 52.
 N. 357=N. 174 plant 1 selfed.
 N. 362=N. 174 plant 52 selfed.
 N. 367=N. 174 plant 22 selfed.
N. 171=K. 1094 plant 11 x N. 37 plant 3.
 N. 344=N. 171 plant 7 selfed.
 N. 349=N. 171 plant 8 selfed.

In the results, points to be particularly noted are :

1. All plants scored in the winter had died down completely.

2. Hairs occurred in N. 171 by genes introduced from N. 37 plant 3 with dense indumentum. There was segregation for presence and absence of hairs and for degree of density when present in both F_1 and F_2 families for both stems and leaves.

3. N. 12 plant 219 was heterozygous for the genes giving mat or shining green surface. K. 1094 plant 52 was homozygous for mat surface. The F_1 was, therefore, all mat and two F_2 families segregated for mat and shining green surface in a summated ratio of 4·5 : 1.

4. Leaf shape in F_1 families was intermediate and F_2 families showed segregation.

5. Number of flowers were from 2 to 40 with very considerable ranges in both F_1 and F_2 families. *S. glareosa* very considerably reduces the number of flowers per inflorescence in crosses with *S. vulgaris*.

6. All F_1 families originated from crosses between coloured and white parents and all segregated for petal colour. All F_2 families from white F_1 plants bred true to white flowers and all from coloured F_1 plants segregated.

7. *Sex.*	N. 208	F x H
	F_1	H 13 : F 31
	N.196	H x H
	F_1	H 51 : F 16
	F_2	H 8 : HF 5
	F_2	H 11 : F 3
	N. 174	H x H
	F_1	H 31 : F 5
	F_2	H 20 : F 17
	F_2	H 13 : F 3
	F_2	F 3
	N. 171	HF x H
	F_1	H 21 : HF 1 : F 13
	F_2	H 17 : HF 1 : F 5
	F_2	H 4 : F 3

8. *Capsules.* There was segregation for capsule type in all families except N. 367 and N. 349.

9. *Seeds.* The only plants to breed true were two F_1 plants with armadillo seeds and one F_1 plant with weak armadillo seeds. All other families segregated with many, and sometimes fluctuating, character variations.

10. Sterility was not marked in F_1 families, except in some individuals in N. 171, but was more or less marked in F_2 families.

xi. SILENE ALPINA x S. VULGARIS AND RECIPROCAL.

N. 177=*S. vulgaris* N. 12 plant 219 x *S. alpina* K. 1091 plant 4. 6 plants in the family.

Habit : centre subcompact, branches prostrate and spreading ; died down in winter ; stems up to 4·6 dm.

Anthocyanin in vegetative parts : much 5 : little 1.

Indumentum : stems dense 5 : medium 1 ; leaves dense 6. The hairs are sub-bristly and longer than in K. 1091 plant 4.

Leaves : intermediate.

Inflorescence : flowers up to 15.

Calyx : inflated 2 : subinflated 4 ; anthocyanin medium 6.

Corolla : W 6. ; bilobed 6 ; 3/4-lobing 6 ; boss 2 : small scale 4 ; anthocyanin blotch present 1 : absent 5 ; petals and segments not overlapping 6.

Sex : hermaphrodite 6.

Androecium : filaments and anthers purple 6.

Gynoecium : stigmata and immature seeds purple 6.

Capsules : *S. maritima* type 1 : hybrid type 5.

Seeds : armadillo 6.

N. 177 plant 3 had indumentum on stems medium, anthocyanin in vegetative parts much, calyx subinflated, small scale, blotch absent, capsule of hybrid type.

N. 352=N. 177 plant 3 selfed. 4 plants in the family.

Habit : centre compact 1 : subcompact 1 : loose 2 ; branches erect 1 : suberect 2 : prostrate 1 ; stems up to 4·3 dm.

Anthocyanin in vegetative parts : medium 4.

Indumentum : stems and leaves medium 3 : glabrous 1.

Leaves : *S. alpina* type 1 : F_1 type 3.

Inflorescence : number of flowers : 2/4, 1/5, 1/11.

Calyx : inflated 1 : subinflated 3 ; anthocyanin medium 2 : little 2.

Corolla : W 4 ; petals bilobed 4, 3/4-lobing 4, boss 4, blotch absent 4, petals and segments not overlapping.

Sex : hermaphrodite 4.

Androecium : filaments purple 1 : white 3 ; anthers purple 4.

Gynoecium : stigmata purple 1 : white 3 ; immature seeds purple 1.

Capsules : *S. vulgaris* type 1.

Seeds : armadillo 1.

Sterility very marked.

N. 191=*S. alpina* K. 1085 plant 57 x *S. vulgaris* N. 12 plant 219. Under controlled pollination no viable seed was set.

N. 192=*S. alpina* K. 1085 plant 5 x *S. vulgaris* N. 37 plant 3. Under controlled pollination this cross gave no viable seed.

N. 197=*S. vulgaris* N. 12 plant 219 x *S. alpina* K. 1085 plant 48. 57 plants in the family. Under controlled selfing 9 flowers gave 309 seeds.

Habit : centre subcompact, branches spreading and ascending ; all died down in winter ; stems up to 5·5 dm.

Anthocyanin in vegetative parts : much 57.

Indumentum : stems medium 4 : few 7 : glabrous 46 ; leaves medium 8 : few 5 : glabrous 44.

Leaves : intermediate and uniform.

Inflorescence : number of flowers 7/5, 9/5, 10/4, 11/8, 12/4, 13/17, 15/6, 17/6, 18/1, 19/1.

Calyx : subinflated 48 ; anthocyanin much 48.

Corolla : W 28 : X 19 : Z 1 ; petals bilobed 48 ; 3/4-lobing 48 ; small scale 29 : boss 19 ; anthocyanin blotch not present 28 ; petals overlapping 33 : not overlapping 15 ; segments overlapping 15 : not overlapping 33.

Sex : hermaphrodite 39 : hermaphrodite and female 1 : female 8.

Androecium : filaments and anthers purple 40.

Gynoecium : stigmata purple 51 ; immature seeds purple 57.

Capsules : *S. maritima* type 5 : hybrid type 51.

Seeds : weak tubercled 2 : weak armadillo 16 : armadillo 38.

No obvious sterility.

N. 197 plant 9 had indumentum stems and leaves medium, petals W, small scale, petals and segments overlapping, hermaphrodite flowers, capsules of hybrid type, seeds weak armadillo.

N. 197 plant 8 had indumentum stems few, leaves medium, petals W, boss, petals overlapping, segments not overlapping, hermaphrodite flowers, capsules *S. maritima* type, seeds armadillo.

N. 197 plant 27 had petals X, small scale, petals not overlapping, segments overlapping, hermaphrodite flowers, capsules of hybrid type, seeds weak armadillo.

N. 359=N. 197 plant 9 selfed. 1 plant in the family.

This single small plant, with stems up to 1·7 dm., did not flower. It had much anthocyanin in the vegetative parts ; indumentum medium on leaves, stems glabrous, and leaf-shape as the *S. alpina* grandparent.

N. 363=N. 197 plant 8 selfed. 2 plants in the family.

Habit : centre loose, stems subprostrate ; up to 2·7 dm.

Anthocyanin in vegetative parts : much 1 : medium 1.

Indumentum : stems few 1 : glabrous 1 ; leaves medium 1 : glabrous 1.

Leaves : F_1 type 1 : verging towards the *S. alpina* grandparent 1.

Inflorescence : number of flowers : up to 7.

Calyx : subinflated 2 ; anthocyanin medium 2.

Corolla : W 2 ; petals bilobed 2, 3/4-lobing 2, boss 2, blotch absent 2, petals and segments not overlapping 2.

Sex : hermaphrodite 2.

Androecium : filaments white 2 ; anthers purple 2.

Gynoecium : stigmata white 2 ; immature seeds purple 2.

Capsules : *S. maritima* type 1.

Seeds : armadillo 1.

N. 354=N. 197 plant 27 selfed. 12 plants in the family.

Habit : centre subcompact, branches erect to slightly ascending ; stems from 2·0 dm. to 6·7 dm.

Anthocyanin in vegetative parts : much 1 : medium 11.

Indumentum : stems few hairs 4 : glabrous 8 ; leaves medium 4 : glabrous 8 ; shining green 2 : mat 10.

Leaves : verging towards *S, vulgaris* grandparent 1 : F_1 type 8 : verging slightly towards *S. alpina* grandparent 2 : rather more so 1.

Inflorescence : number of flowers 2/1, 3/1, 5/2, 7/5, 9/1, 11/1, 25/1.

Calyx : subinflated 12 ; anthocyanin medium 9 : little 3.

Corolla : W 7 : X 5 ; petals bilobed 11, 3/4-lobing 11, boss 11, blotch present 3 : absent 8, petals and segments not overlapping 11.

Sex : hermaphrodite 10 : female 1.

Androecium : filaments purple 9 : white 1 ; anthers purple 10.

Gynoecium : stigmata purple 8 : white 3 ; immature seeds purple 5 : white 3.

Capsules : hybrid type 5.

Seeds : weak tubercled 1 : weak armadillo 3 : armadillo 1.

Very great sterility.

N. 184=*S. alpina* K. 1085 plant 15 x *S. vulgaris* N. 12 plant 219. 37 plants in the family. Under controlled pollination 3 flowers gave 228 seeds.

Habit : centre compact, flowering branches subspreading and ascending ; all died down in winter ; stems up to 4 dm.

Indumentum : short and bristly. Stems few 5 : glabrous 32 ; leaves dense 5 : medium 1 : few 3 : glabrous 28.

Leaves : intermediate but verging towards N. 12 plant 219.

Anthocyanin in vegetative parts : much 1 : medium 26.

Inflorescence : up to 16 flowers.

Calyx : inflated 22 : subinflated 15 ; anthocyanin medium 37.

Corolla : W 25 : X 12 ; petals bilobed 37 ; 3/4-lobing 37 ; boss 37 ; anthocyanin blotch present 1 : absent 36 ; petals not overlapping 37 ; segments overlapping 6 : not overlapping 23.

Sex : hermaphrodite 10 : female 27.

Androecium : filaments and anthers purple 10.

Gynoecium : stigmata purple 37 ; immature seeds purple 37.

Capsules : *S. maritima* type 15 : hybrid type 22.

Seeds : weak armadillo 11 : armadillo 26.

No sterility in open pollination.

N. 184 plant 12 had glabrous stems and leaves, anthocyanin in vegetative parts medium, calyx inflated, petals W, blotch absent, segments not overlapping, hermaphrodite flowers, capsules of hybrid type, seeds armadillo.

N. 366=N. 184 plant 12 selfed. 3 plants in the family.

Habit : stems up to 3·0 dm.

Anthocyanin in vegetative parts : much 2 : medium 1.

Indumentum : few, very short hairs 1 : glabrous 2.

Leaves : F_1 type 1 : *S. alpina* type 2.

Inflorescence : number of flowers 5/2.

Calyx : subinflated 3 ; anthocyanin medium 2 : little 1.

Corolla : W 2 ; petals bilobed 2, 3/4-lobing 2, boss 2, blotch absent 2, petals and segments not overlapping 2.

Sex : hermaphrodite 2.

Androecium : filaments purple 2 ; anthers purple 1.

Gynoecium : stigmata white 2 ; immature seeds white 1.

Capsules : none scorable.

Seeds : armadillo 1.

Almost complete sterility.

The families dealt with in this section are :

N. 177=N. 12 plant 219 x K. 1091 plant 4.

N. 352=N. 177 plant 3 selfed.

N. 197=N. 12 plant 219 x K. 1085 plant 48.

N. 359=N. 197 plant 9 selfed.

N. 363=N. 197 plant 8 selfed.

N. 354=N. 197 plant 27 selfed.

N. 184=K. 1085 plant 15 x N. 12 plant 119.

N. 366=N. 184 plant 12.

In the results, points to be particularly noted are :

1. All plants that could be scored in the second winter of their age died down.

2. All families segregated for indumentum characters.

3. Two shining green plants appeared in N. 354. The genes for this were introduced from N. 12 plant 219.

4. For leaf shapes, F_1 plants were intermediate and there was segregation in F_2 families.

5. Flower number was reduced by genes from *S. alpina*, but, in the larger families, there was a considerable range in both F_1 and F_2.

6. There was segregation for petal colour in two F_1 families and in one F_2 family.

7. *Sex.*

N.177.	H x H
F_1	H 6
F_2	H 4
N. 197.	H x H
F_1	H 39 : HF 1 : F 8
F_2	H 2
F_2	H 10 : F 1
N. 184.	F x H
F_1	H 10 : F 27
F_2	H 2

8. *Seeds.* N. 12 plant 219 had weak armadillo seeds. This modified type occurred in two F_1 families and in one F_2 family.

9. *Capsules.* There was segregation for capsule shape in all F_1 families.

10. *Sterility* was not obvious in two F_1 families but was very marked to almost complete in F_2 families.

xii. SILENE VULGARIS, S. GLAREOSA, AND S. ALPINA CROSSED WITH S. VULGARIS (NORWAY).

N. 216=*S. vulgaris* N. 12 plant 219 x *S. vulgaris* (Norway) P. 1 plant 11. 23 plants in the family. Under controlled pollination 2 flowers produced 65 seeds.

Habit : centre subcompact, branches spreading and ascending ; died down in the winter ; stems up to 5·5 dm. ; glabrous.

Anthocyanin in vegetative parts : medium 23.

Leaves : very similar to P.1 plant 11.

Inflorescence : number of flowers up to 75.

Calyx : subinflated 23 ; anthocyanin medium 23.

Corolla : W 23 ; petals bilobed 23 ; 3/4-lobing 23 ; small scale 4 : boss 19 ; anthocyanin blotch absent 23 ; petals and segments not overlapping 23.

Sex : hermaphrodite 7 : femal[illegible]6.

Androecium : filaments and anthers purple 7.

Gynoecium : stigmata purple 23 ; immature seeds purple 11 : white 12.

Capsules : intermediate between *S. maritima* and hybrid types 1 : hybrid type 12 : intermediate between *S. vulgaris* and hybrid types 8 : *S. vulgaris* type 2.

Seeds : tubercled to weak tubercled 2 : weak tubercled to weak armadillo 9 : weak tubercled to armadillo 1 : armadillo 11.

N. 216	Capsules	Seeds	Average per capsule
Plant 3 selfed	10	266	26·6
Plant 11 selfed	11	242	22·0

N. 216 plant 3 had boss, hermaphrodite flowers, immature seeds white, capsules of hybrid type, seeds armadillo.

N. 216 plant 11 had small scale, hermaphrodite flowers, immature seeds white, capsules intermediate between *S. vulgaris* and hybrid types, seeds weak tubercled to weak armadillo.

N. 216 plant 22 had boss, hermaphrodite flowers, immature seeds white, capsules intermediate between *S. vulgaris* and hybrid types, seeds armadillo.

P. 1 plant 11 had much anthocyanin in vegetative parts and calyx, glabrous , 17 flowers, subinflated calyx, petals white bilobed 3/4-lobing small scale anthocyanin blotch absent petals and segments not overlapping, zygomorphic hermaphrodite flowers, filaments anthers and stigmata purple, immature seeds white, capsules *S. maritima* type, seeds armadillo. P. 1 plant 11 was a plant grown from seed collected in Norway and was determined as *S. vulgaris* s.l., not equivalent to British *S. vulgaris* stocks in various characters. (see K.B. 1939, 466 for a full account).

N. 364=N. 216 plant 3 selfed. 34 plants in the family.

Habit : stems up to 6·0 dm.

Anthocyanin in vegetative parts : medium 20 : little 3.

Indumentum : all glabrous.

Leaves : F_1 type 33.

Inflorescence : number of flowers : up to 50.

Calyx : subinflated 33 ; anthocyanin medium 19 : little 14.

Corolla : W 33 ; petals bilobed 33, 3/4-lobing 33, boss 33, blotch absent 33, petals and segments not overlapping 33.

Sex : hermaphrodite 22 : hermaphrodite and female 2 : female 9.

Androecium : filaments purple 23 : white 1 ; anthers purple 23.

Gynoecium : stigmata purple 31 : white 2 ; immature seeds white 19.

Capsules : *S. vulgaris* type 6 : hybrid type 21.

Seeds : armadillo 29.

Sterility marked in some plants only.

N. 365=N. 216 plant 11 selfed. 22 plants in the family.

Habit : stems up to 7·0 dm.

Anthocyanin in vegetative parts : much 1 : medium 20.

Indumentum : all glabrous.

Leaves : F_1 type 18 : verging a little towards the British *S. vulgaris* grandparent 4.

Inflorescence : number of flowers up to 31.

Calyx : subinflated 21 ; anthocyanin medium 21.

Corolla : W 21 ; petals bilobed 21, 3/4-lobing 21, boss 21, blotch absent 21, petals and segments not overlapping 21.

Sex : hermaphrodite 14 : female 7.

Androecium : filaments and anthers purple 14.

Gynoecium : stigmata purple 2 : white 19 ; immature seeds white 14.

Capsules : *S. vulgaris* type 2 : hybrid type 13.

Seeds : tubercled 5 : weak tubercled 6 : weak armadillo 1 : armadillo 4. Sterility marked in many plants.

N. 360=N. 216 plant 22 selfed. 31 plants in the family.

Habit : stems up to 6·0 dm.

Anthocyanin in vegetative parts : much 3 : medium 22 : little 6.

Indumentum : all glabrous.

Leaves : F_1 type 31 : verging slightly towards the *S. vulgaris* grandparent 1.

Inflorescence : number of flowers up to 46.

Calyx : subinflated 31 ; anthocyanin medium 31.

Corolla : W 31 ; petals bilobed 31, 3/4-lobing 31, boss 21, blotch absent 31, petals and segments not overlapping 31.

Sex : hermaphrodite 19 : female 12.

Androecium : filaments purple 17 : white 2 ; anthers purple 19.

Gynoecium : stigmata purple 12 : white 19 ; immature seeds white 22.

Capsules : *S. vulgaris* type 14 : hybrid type 8.

Seeds : armadillo 27.

Sterility marked in many plants.

Crosses involving S. vulgaris (Norway) and S. vulgaris (Britain).

The families dealt with in this subsection are :

N. 216=N. 12 plant 219 x P. 1 plant 11.

N. 364=N. 216 plant 3 selfed.

N. 365=N. 216 plant 11 selfed.

N. 360=N. 216 plant 22 selfed.

In the results, points to be particularly noted are :

1. The plants all died down in the winter and were all glabrous.

2. The flower number per inflorescence was high, maxima ranging from 31 to 75.

3. *Sex.*	N. 216	H x H
	F_1	H 7 : F 16
	F_2	H 22 : HF 2 : F 9
	F_2	H 14 : F 7
	F_2	H 19 : F 12

4. *Seeds.* Plants with armadillo seeds of F_1 families bred true to this character. Families involving an immediate parent with weak armadillo seeds segregated and in one F_2 family even tubercled seeds were recorded.

5. *Sterility* occurred in some plants of F_2 families.

N. 215=*S. glareosa* K. 1094 plant 20 x *S. vulgaris* (Norway) P. 1 plant 11. 21 plants in the family. Under controlled pollination 6 flowers produced 281 seeds.

Habit : centre subcompact, branches spreading erect at ends ; all died down in winter ; stems up to 5·0 dm.

Surface : all glabrous, all mat.

Leaves : intermediate, but in length nearer to P. 1 plant 11 and in breadth to K. 1094 plant 20.

Anthocyanin in vegetative parts : much 2 : medium 12 : little 7.

Inflorescence : number of flowers 11/2, 12/3, 13/1, 14/3, 15/1, 16/1, 19/1, 20/2, 22/1, 23/1, 24/1, 25/1, 26/1, 28/1, 35/1.

Calyx : subinflated 21 ; anthocyanin much 2 : medium 19.

Corolla : W 11 : X 9 : Y 1 ; petals bilobed 21 ; 3/4-lobing 21 ; scale 6 : small scale 10 : boss 5 ; anthocyanin blotch present 1 : absent 20 ; petals and segments not overlapping.

Sex : hermaphrodite and female 1 : female 20.

Androecium : filaments and anthers purple 1.

Gynoecium : stigmata purple 21 ; immature seeds purple 21.

Capsules : *S. maritima* type 18 : hybrid type 3.

Seeds : tubercled 5 : tubercled to weak tubercled 11 : tubercled to weak armadillo 1 : weak tubercled to weak armadillo 4.

N. 218=*S. glareosa* K. 1099 plant 46 x *S. vulgaris* (Norway) P. 1 plant 11. 17 plants in the family. Under controlled pollination 7 flowers produced 154 seeds.

Habit : centre subcompact, branches spreading and ascending ; stems died down in winter ; stems up to 5·5 dm.

Indumentum : all glabrous.

Leaves : intermediate.

Anthocyanin in vegetative parts : medium 17.

Inflorescence : number of flowers up to 18.

Calyx : inflated 4 : subinflated 13 ; anthocyanin medium 17.

Corolla : W 5 : X 12 ; petals bilobed 17 ; 3/4-lobing 17 ; small scale 5 : boss 12, anthocyanin blotch present 13 : absent 3 ; petals and segments not overlapping.

Sex : hermaphrodite 8 : female 9.

Androecium : filaments and anthers purple 8.

Gynoecium : stigmata purple 17 ; immature seeds purple 8 : white 9.

Capsules : *S. maritima* type 17.

Seeds : armadillo 17.

With open pollination no marked sterility.

N. 218 plant 13 had calyx subinflated, petals X, boss, blotch present, hermaphrodite flowers, immature seeds white.

N. 218 plant 11 had calyx inflated, petals W, small scale, blotch absent, hermaphrodite flowers, immature seeds white.

N. 218 plant 3 had calyx inflated, petals W, small scale, blotch present, hermaphrodite flowers, immature seeds purple.

N. 347=N. 218 plant 13 selfed. 44 plants in the family.

Habit : centre subcompact and branches suberect ; stems up to 4·5 dm.

Anthocyanin in vegetative parts : much 3 : medium 32 : little 7.

Indumentum : glabrous.

Leaves : F_1 type 5 : *S. glareosa* type 30 : smaller and narrower 5 : verging from F_1 type towards *S. vulgaris* 3.

Inflorescence : number of flowers. 3/2, 4/1, 5/2, 6/3, 7/12, 8/3, 9/5, 10/3, 11/1, 12/2, 13/1, 14/3, 16/1, 17/2, 20/1, 25/1.

Calyx : subinflated 42 ; anthocyanin medium 42, none 1.

Corolla : W 6 : X 7 : Y 18 : Z 11 ; petals bilobed 42, 3/4-lobing 42, small scale 1 : boss 41, blotch present 27 : absent 15, petals and segments not overlapping 42.

Sex : hermaphrodite 33 : female 9.

Androecium : filaments and anthers purple 3.

Gynoecium : stigmata purple 39 : white 3 ; immature seeds white 23.

Capsules : *S. maritima* type 17.

Seeds : armadillo 32.

Sterility very marked.

N. 348=N. 218 plant 11 selfed. 4 plants in the family.

Habit : centre subcompact 1 : loose 3, branches ascending 4 ; stems up to 4·0 dm.

Anthocyanin in vegetative parts : medium 3 : little 1.

Indumentum : all glabrous.

Leaves : all *S. glareosa* type.

Inflorescence : number of flowers 10/2, 14/2.

Calyx : subinflated 4 ; anthocyanin much 3 : medium 1.

Corolla : W 4 ; petals bilobed 4, 3/4-lobing 4, boss 4, blotch absent 4, petals and segments not overlapping 4.

Sex : hermaphrodite 4.

Androecium : filaments and anthers purple 4.

Gynoecium : stigmata purple 4.

Capsules : none scorable.

Seeds : armadillo 1.

Almost complete sterility.

N. 345=N. 218 plant 3 selfed. 13 plants in the family.

Habit : centre loose 13, branches subprostrate 13 ; stems up to 6·0 dm.

Anthocyanin in vegetative parts : much 1 : medium 11 : little 1.

Indumentum : all glabrous.

Leaves : F_1 type 3 : *S. glareosa* type 9.

Inflorescence : number of flowers 7/2, 8/4, 9/2, 10/1, 12/1, 14/1, 55/1.

Calyx : subinflated 13 ; anthocyanin medium 12 : little 1.

Corolla . W 13 ; petals bilobed 13, 3/4-lobing 12 : 2/3-lobing 1, small scale 4 : boss 9, blotch present 4 : absent 9, petals and segments not overlapping 13.

Sex : hermaphrodite 12 : female 1.

Androecium : filaments and anthers purple 12.

Gynoecium : stigmata purple 12 : white 1 ; immature seeds purple 1.

Capsules : *S. maritima* type 12.

Seeds : armadillo 12.

Sterility marked.

Crosses involving S. vulgaris (Norway) and S. glareosa.

The families dealt with in this subsection are :

N. 215= K. 1094 plant 20 x P. 1 plant 11.

N. 218=K. 1099 plant 46 x P. 1 plant 11.

N. 347=N. 218 plant 13 selfed.

N. 348=N. 218 plant 11 selfed.

N. 345=-N. 218 plant 3 selfed.

In the results, points to be particularly noted are .

1. The plants all died down in the winter and were glabrous.

2. The flower number per inflorescence showed a very great range from 11 to 35 in F_1 and 3 to 55 in F_2 families. The maximum in N. 345 greatly exceeded the maximum for either grandparent.

3. Families where one parent had coloured flowers segregated for colour. White flowered plants bred true on selfing for this character.

4. *Sex.*

	F x H
F_1	HF 1 : F 20
	H x H
F_1	H 8 : F 9
F_2	H 33 : F 9
F_2	H 4
F_2	H 12 : F 1

5. Plants with armadillo seeds bred true to this character on crossing and selfing. When a plant with weak tubercled to weak armadillo seeds was fertilized by pollen from a plant with armadillo seeds there was complex segregation.

6. Sterility was marked to almost complete in F_2 families.

N. 217=*S. alpina* K. 1085 plant 57 x *S. vulgaris* (Norway) P. 1 plant 11. 4 plants in the family. Under controlled pollination 6 flowers produced 26 seeds.

Habit : centre rather compact, branches spreading and ascending ; stems up to 3·4 dm.

Surface : all glabrous, all mat.

Leaves : intermediate, but verging to P. 1 plant 11.

Anthocyanin in vegetative parts : medium 3 : little 1.

Inflorescence : number of flowers up to 11.

Calyx : subinflated 4 ; anthocyanin much 1 : medium 3.

Corolla : W 2 : X 2 ; petals bilobed 4 ; 3/4-lobing 4 ; boss 4 ; anthocyanin blotch absent ; petals not overlapping 4 ; segments overlapping 1 : not overlapping 3.

Sex : hermaphrodite 1 : female 3.

Androecium : filaments and anthers purple 1.

Gynoecium : stigmata purple 4 ; immature seeds purple 4.

Capsules and seeds : not produced.

xiii. SELFING OF AND CROSSES INVOLVING S. GLAREOSA FROM THE TYROL.

P. 9 plant 1. *S. glareosa.* Grown from seed collected in the Tyrol by Dr. C. D. Darlington.

Habit : centre subcompact, branches spreading and suberect ; died down in winter ; stems up to 3·5 dm.

Indumentum : short bristly, medium on stems and few on leaves.

Leaves : narrowly lanceolate, linear-lanceolate, to narrowly oblanceolate, acute, up to 3 cm. long and 0·8 cm. broad.

Anthocyanin in vegetative parts : little.

Inflorescence : flowers up to 9.

Calyx : subinflated ; anthocyanin medium.

Corolla : W ; petals bilobed ; 3/4-lobing ; boss ; anthocyanin blotch absent ; petals and segments not overlapping.

Sex : hermaphrodite.

Androecium : filaments and anthers purple.

Gynoecium : stigmata purple ; immature seeds white.

Capsules : *S. maritima* type.

Seeds : armadillo.

N. 206=P. 9 plant 1 selfed. 1 plant in the family. Under controlled selfing 15 flowers produced 315 seeds.

Habit : centre subcompact, branches spreading and suberect ; died down in winter ; stems up to 2·5 dm.

Indumentum : short bristly, medium on stems and few on leaves.

Leaves : as parent.

Anthocyanin in vegetative parts : little.

Inflorescence : up to 7 flowers.

Calyx : subinflated ; anthocyanin medium.

Corolla : W ; petals bilobed ; 3/4-lobing ; boss ; anthocyanin blotch absent ; petals and segments not overlapping.

Sex : hermaphrodite.

Androecium : filaments and anthers purple.

Gynoecium : stigmata purple ; immature seeds white.

Capsules : *S. maritima* type.

Seeds : armadillo.

N. 201=*S. glareosa* K. 1094 plant 11 x *S. glareosa* (Tyrol) P. 9 plant 1. 1 plant in the family. Under controlled pollination 5 flowers gave 232 seeds.

Habit : centre subcompact, branches spreading and suberect ; died down in winter ; stems up to 3·6 dm.

Indumentum : glabrous.

Leaves : as parents.

Anthocyanin in vegetative parts : medium.

Inflorescence : number of flowers 1 to 9, mostly 3.

Calyx : subinflated ; anthocyanin medium.

Corolla : X ; petals bilobed ; 3/4-lobing ; boss ; anthocyanin blotch absent ; petals and segments not overlapping.

Sex : female.

Gynoecium : stigmata purple ; immature seeds purple.

Capsules : *S. maritima* type.

Seeds : weak tubercled to weak armadillo.

N. 200=*S. vulgaris* N. 12 plant 219 x *S. glareosa* (Tyrol) P. 9 plant 1. 28 plants in the family. Under controlled pollination 6 flowers produced 224 seeds.

Habit : centre subcompact, branches spreading and ascending ; all died down in the winter ; stems up to 5·1 dm.

Indumentum : medium 2 : few 2 : glabrous 24.

Leaves : intermediate, but nearer to N. 12 plant 219.

Anthocyanin in vegetative parts : medium 13 : little 15.

Inflorescence : flowers up to 22.

Calyx : inflated 15 : subinflated 13 ; anthocyanin medium 28.

Corolla : W 28 ; petals bilobed 28 ; 3/4-lobing 28 ; boss 28 ; anthocyanin blotch absent 28 ; petals not overlapping 28 ; segments overlapping 3 : not overlapping 25.

Sex : hermaphrodite 18 : female 10.

Androecium : filaments purple 15 : white 3 ; anthers purple 18.

Gynoecium : stigmata purple 18 : white 9 ; immature seeds purple 13 : white 15.

Capsules : *S. maritima* type 11 : hybrid type 17.

Seeds : weak armadillo 7 : armadillo 21.

N. 205=K. 1085 plant 5 x P. 9 plant 1. 6 plants in the family. Under controlled pollination 3 flowers produced 114 seeds.

Habit : subcompact centre with subspreading branches ; died down in winter ; stems up to 3·0 dm.

Indumentum : stems medium 5 : few 1 ; leaves dense 3 : medium 1 : few 2.

Leaves : intermediate.

Anthocyanin in vegetative parts : medium 6.

Inflorescence : number of flowers 1 to 5.

Calyx : inflated 2 : subinflated 4 ; anthocyanin much 5.

Corolla : W 3 : X 3 ; petals bilobed 6 ; 3/4-lobing 6 ; boss 6 ; anthocyanin blotch absent 6 ; petals and segments not overlapping 6.

Sex : female 6.

Gynoecium : stigmata purple 6 ; immature seeds purple 6.

Capsules : *S. maritima* type 6.

Seeds : armadillo 6.

Selfing of and crosses involving S. glareosa (Tyrol).

Familes involved in this series are :

N. 206= 9 plant 1 (*S. glareosa*, Tyrol) selfed.

N. 201=K. 1094 plant 11 (*S. glareosa*, France) x P. 9 plant 1.

N. 200=N. 12 plant 219 (*S. vulgaris*, Britain) x P. 9 plant 1.

N. 205=K. 1085 plant 5 (*S. alpina*, France) x P. 9 plant 1.

In the results, points to be particularly noted are :

1. All plants died down in the winter.

2. With the introduction of *S. vulgaris* genes the number of flowers per inflorescence rises considerably.

3. *Sex.* P. 9 plant 1 was hermaphrodite (H). F_1 families
with HF x H gave F 1
with H x H gave H 18 : F 10.
with HF x H gave F 5.

4. Capsules were all of *S. maritima* type, except when *S. vulgaris* was the ovule parent when in F_1 there were *S. maritima* type 11 : hybrid type 17.

5. *Sterility.* This was very marked indeed in the selfing of P. 9 plant 1 and in crosses between this and either *S. glareosa* from France or *S. alpina* from France ; it was less marked when crossed with *S. vulgaris* from Britain. The sterility expressed itself in failure of seeds to germinate.

xiv. CROSSINGS INVOLVING A PLANT GROWN FROM SEED FROM AN S. GLAREOSA POPULATION AND HAVING ENTIRE AND ROUNDED TO EMARGINATE PETALS AND STAMINODES.

The original seed of K. 1099 came from eastern France near, St. Nizier, from plants growing on upper limestone screes in beech-conifer woods, 7 8.1931.

The families dealt with in this section are :

N. 146=K. 1099 plant 41 x S.P.A. 13 (*S. maritima*, Chesil Beach).

N. 274=N. 146 plant 18 selfed.

N. 275=N. 146 plant 15 selfed.

N. 276=N. 146 plant 24 selfed.

N. 147=K. 1099 plant 41 x S.P.A.70 (*S. maritima*, Chesil Beach).

N. 268=N. 147 plant 8 selfed.

N. 269=N. 147 plant 2 selfed.

N. 278=N. 147 plant 7 selfed.

N. 300=N. 147 plant 6 x N. 147 plant 7.

N. 271=N. 147 plant 6 x N. 104 plant 10 (*S. maritima* selfing, Chesil Beach).

N. 307=N. 147 plant 6 x N. 104 plant 11 (as last).

N. 148=K. 1099 plant 41 x S.P.A. 15 (*S. maritima*, narrow-leaved, Chesil Beach).

N. 272=N. 148 plant 37 selfed.

N. 273=N. 148 plant 47 selfed.

N. 282=N. 148 plant 59 selfed.

N. 283=N. 148 plant 57 selfed.

N. 320=N. 148 plant 52 selfed.

N. 149=K. 1099 plant 41 x N. 18 plant 11 (*S. maritima* selfed, Porlock).

N. 270=N. 149 plant 10 selfed.

N. 321=N. 149 plant 4 selfed.

N. 281=N. 149 plant 34 x N. 18 plant 11.

N. 291=N. 149 plant 4 x N. 18 plant 11.

N. 305=N. 149 plant 7 x N. 18 plant 11.

N. 303=N. 149 plant 10 x N. 156 plant 2 (*S. maritima*, selfing, selfed, Porlock).

N. 312=N. 149 plant 34 x N. 156 plant 2 (*S. maritima*, as above).

N. 315=N. 149 plant 7 x N. 148 plant 52 (see above).

N. 154=K. 1099 plant 41 x S.P.B. 37 (*S. vulgaris*, Loch Tay).

N. 277=N. 154 plant 25 selfed.

N. 299=N. 154 plant 23 x N. 154 plant 25.

N. 301=N. 154 plant 49 x N. 154 plant 25.

N. 304=N. 154 plant 28 x N. 154 plant 25.

N. 293=N. 154 plant 23 x N. 121 plant 3 (*S. vulgaris*, Loch Tay, selfing).

N. 294=N. 154 plant 27 x N. 121 plant 3.

N. 295=N. 154 plant 28 x N. 121 plant 3.

N. 155=K. 1099 plant 41 x N. 12 plant 251 (*S. vulgaris*. selfing, Potterne Field).

N. 290=N. 155 plant 30 selfed.

N. 310=N. 155 plant 36 selfed.

N. 298=N. 155 plant 1 x N. 155 plant 30.

N. 309=N. 155 plant 1 x N. 155 plant 36.

K. 1099 plant 41. *S. glareosa* emarginate variant.

Habit : stems spreading, subprostrate in flower with ends just ascending, up to 6·3 dm. in length, with medium anthocyanin in the vegetative parts, glabrous, mat. Complete dying down in the winter.

Leaves : narrowly elliptic or elliptic-oblanceolate, slightly acuminate, 3·3 cm. long and 1·4 cm. broad (average), green, mat.

Inflorescence : with up to 14 flowers ; bracts acuminate, lower green-herbaceous, upper scarious, eciliate.

Calyx : subinflated, with medium anthocyanin.

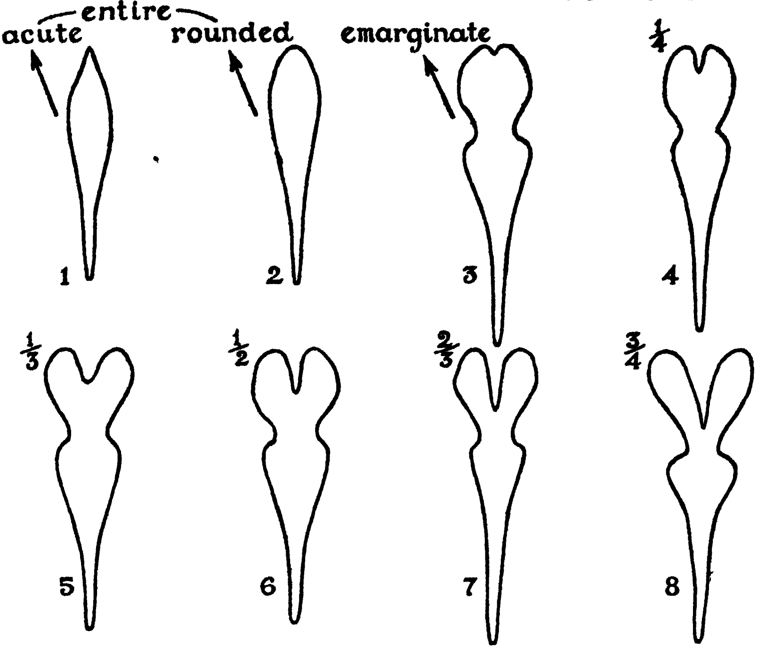
Corolla : with petals Marguerite Yellow (Ridgway, Color Standards Plate XXX.), narrowly oblanceolate, 1·4 cm. long, 0·3 cm. broad, entire and rounded to emarginate, little or no trace of a boss, anthocyanin blotch absent, petals not overlapping.

Sex : female, constant for life of 5 years.

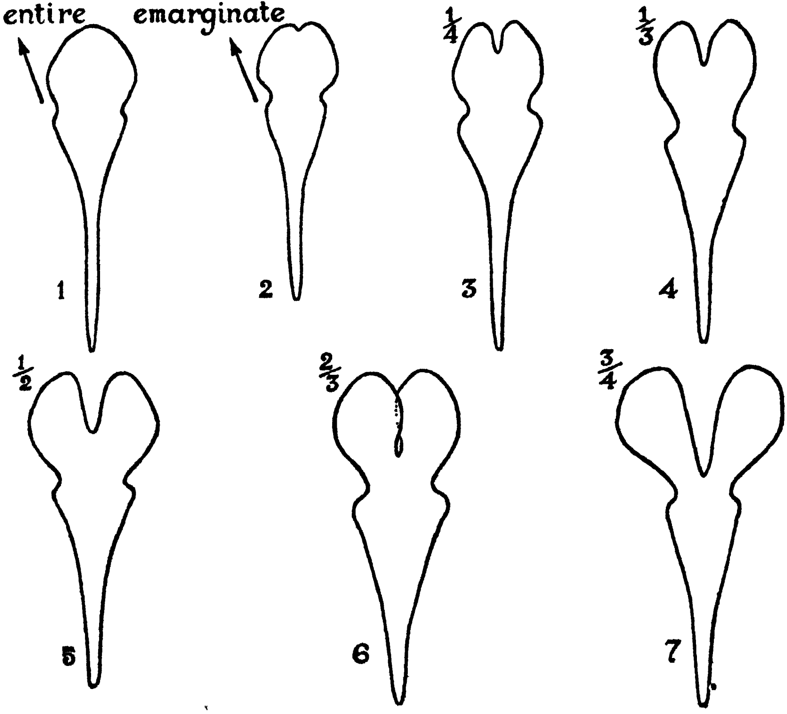
Androecium : with stamens represented by 10 petaloid staminodes which are narrowly oblanceolate-linear subacute 1·3 cm. long 0·15 cm. broad.

Gynoecium : stigmata purple ; immature seeds white.

FROM F1 PLANTS OF EMARGINATA X VULGARIS



FROM F1 PLANTS OF EMARGINATA X MARITIMA



Series of petals to show range from entire to 3/4-lobing. Top series from the cross *S. glareosa* emarginate variant x *S. vulgaris*. Bottom series from the cross *S. glareosa* emarginate variant x *S. maritima*.

Capsules : of *S. maritima* type, ovoid, 7·5 mm. long, 6·5 mm. broad, mouth 4 mm. diam., teeth strongly reflexed, 1·5 mm. long, 1·5 mm. broad at the base, carpophore 3 mm. long, 2·25 mm. diam.

Seeds : armadillo.

N. 146=*S. glareosa* emarginate variant K. 1099 plant 41 x *S. maritima* S.P.A. 13. 75 plants in the family.

Habit : spreading and all prostrate ; some, mostly few, overwintering shoots 37, none in 38 ; stems up to 4·3 dm.

Surface : all glabrous, all mat.

Leaves : all intermediate but nearer to S.P.A. 13.

Anthocyanin in vegetative parts : medium 47 : little 28.

Inflorescence : number of flowers 7/61, 8/3, 9/4, 10/2, 11/2, 12/1, 13/1, 15/1.

Calyx : inflated 4 : subinflated 71 ; anthocyanin medium 62 : little 13.

Petals : colour Marguerite Yellow 15 : white 60 ; entire 1 : bilobed 72: multilobed 2 ; entire 1 : emarginate 10 : 1/4-lobing 5 : 1/3-lobing 7 : 1/2-lobing 20 : 2/3-lobing 6 : 3/4-lobing 26 ; small scale 2 : boss 69 : none 4 ; blotch none ; petals not overlapping 75 ; segments not overlapping 74.

Sex : hermaphrodite 11 : hermaphrodite and female 3 : female 61.

Androecium : filaments purple 10 : white 4 ; anthers purple 13 ; with non-polliniferous anthers 33 ; petaloid staminodes 1.

Gynoecium : stigmata purple 69 : white 6 ; immature seeds purple 74.

Capsules : *S. maritima* type 70.

Mature seeds : armadillo 26 : weak armadillo 42.

Sterility : much occurred in this family in open pollination.

N. 146 plant 18 gave an average of 4·7 seeds per capsule from 18 capsules, a total of 83 seeds from which only 7 plants were raised.

N. 146 plant 15 gave an average of 5·3 seeds per capsule from 25 capsules. a total of 133 seeds from which only 19 plants were raised.

N. 146 plant 24 gave an average of 4·4 seeds per capsule from 18 capsules, a total of 80 seeds from which only 19 plants were raised.

All the above were from selfing under full control.

N. 146 plant 18 had anthocyanin in vegetative parts little ; 7 flowers ; calyx subinflated with medium anthocyanin ; petals white, bilobed, 1/4 to 1/3-lobing, boss ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds armadillo.

N. 146 plant 15 had anthocyanin in vegetative parts little ; 7 flowers ; calyx sub-inflated with medium anthocyanin ; petals white, bilobed, 3/4-lobing, boss ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds weak armadillo.

N. 146 plant 24 had anthocyanin in vegetative parts little ; 7 flowers ; calyx subinflated with little anthocyanin ; petals white, bilobed, 3/4 lobing, small scale ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds weak armadillo.

S.P.A. 13 was described in K.B. 1929, 150 and a family raised by selfing it in K.B. 1933, 357. It and its offspring on selfing were typical *S. maritima.* S.P.A. 13 had subinflated (ellipsoid) calyx, poor petals, petals and segments not overlapping, bilobed, 3/4-lobing, small scale, no blotch, filaments white, anthers purple, white stigmata, purple immature seeds, mature seeds armadillo.

N. 274=N. 146 plant 18 selfed. 7 plants in the family.

Habit : subprostrate and spreading 6 : suberect and subspreading 1 ; no overwintering barren shoots ; stems up to 3·6 dm.

Surface : all glabrous, all mat.

Leaves : HM 2 : MH 2 : GH 2 : HG 1.

Anthocyanin in vegetative parts : medium 4 : little 3.

Inflorescence : number of flowers 4/4, 7/1, 10/1, 18/1.

Calyx : inflated 4 ; subinflated 3 ; anthocyanin much 1 : medium 5 : little 1.

Corolla : white 7 ; petals bilobed 7 ; 1/2-lobing 3 : 2/3-lobing 2 : 2/3-3/4-lobing 1 ; boss 7 ; anthocyanin blotch none ; petals overlapping 1 : not overlapping 6 ; segments overlapping 1 : not overlapping 6.

Sex : hermaphrodite 3 : hermaphrodite and female 1 : female 3.

Androecium : filaments purple 2 : white 2 ; anthers purple 4 ; no non-polliferous anthers and no petaloid staminodes.

Gynoecium : stigmata purple 4 : white 3 ; immature seeds purple 6 : white 1.

Capsules : *S. maritima* type 3.

Mature seeds : armadillo 3.

Sterility : much occurred in the family, with open pollination.

N. 275=N. 146 plant 15 selfed. 19 plants in the family.

Habit : subprostrate and spreading 13 : suberect and subspreading 6 ; overwintering barren shoots present in good numbers ; stems up to 3·6 dm.

Surface : all glabrous, all mat.

Leaves : M 6 : HM 5 : H 6 : G H 2.

Anthocyanin in vegetative parts : medium 8 : little 11.

Inflorescence : number of flowers 3/1, 4/1, 7/7, 9/2, 10/1, 11/1, 13/2, 15/4.

Calyx : inflated 2 : subinflated 15 : narrow 2 ; anthocyanin medium 17 : little 2.

Corolla : Marguerite Yellow 5 : white 14 ; petals bilobed 19 ; emarginate 3 : 1/3-lobing 2 : 1/2-lobing 1 : 2/3-lobing 6 : 3/4-lobing 7 ; scale 1 : small scale 7 : boss 6 : none 5 ; anthocyanin blotch present 1 : absent 18 ; petals overlapping 8 : not overlapping 10 ; segments overlapping 4 : not overlapping 14 ; poor petal 1.

Sex : hermaphrodite 5 : female 14.

Androecium : filaments purple 3 : white 2 ; anthers purple 5 ; non-polliniferous anthers 8 ; petaloid staminodes 3. Plant 13 had petaloid staminodes which were cream, bilobed, and indistinguishable from the petals.

Gynoecium : stigmata purple 13 : white 6 ; immature seeds purple 15 : white 4.

Capsules : *S. maritima* type 15.

Mature seeds : armadillo 7 : weak armadillo 3.

Sterility : much occurred in the family, with open pollination.

N. 276=N. 146 plant 24 selfed. 19 plants in the family.

Habit : subprostrate and spreading ; some overwintering barren shoots, but mostly die back ; stems up to 4·0 dm.

Surface : all glabrous, all mat.

Leaves : HM 2 : MH 3 : GH 7 : HG 6 : G 1.

Anthocyanin in vegetative parts : medium 17 : little 2.

Inflorescence : number of flowers 6/1, 7/15, 8/2, 13/1.

Calyx : inflated 3 : subinflated 16 ; anthocyanin medium 16 : little 3.

Corolla : Marguerite Yellow 1 : white 18 ; bilobed 19 ; 1/3-lobing 3 : 1/2-lobing 5 : 2/3-lobing 6 : 3/4-lobing 5 ; scale 7 : small scale 5 : boss 7 ; anthocyanin blotch absent 19 ; petals overlapping 16 : not overlapping 3 ; segments not overlapping 19.

Sex : hermaphrodite 9 : hermaphrodite and female 1 : female 9.

Androecium : filaments purple 10; anthers purple 10 ; non-polliniferous anthers 4 ; petaloid staminodes 0

Gynoecium : stigmata purple 17 : white 2 ; immature seeds purple 17 : white 2.

Capsules : *S. maritima* type 16.

Mature seeds : armadillo 3 : weak armadillo 3 : weak tubercled 2.

Sterility : much with open pollination.

N. 147=*S. glareosa* emarginate variant K. 1099 plant 41 x *S. maritima* S.P.A. 70. 77 plants in the family.

Habit : spreading and subprostrate ; no overwintering barren shoots but 33 showed a little green ; stems up to 4·5 dm.

Surface : all glabrous, all mat.

Leaves : all intermediate but nearer to S.P.A. 70.

Anthocyanin in vegetative parts : much 1 : medium 67 : little 9.

Inflorescence : number of flowers 7/69, 8/1, 9/1, 10/2, 11/1, 12/2, 13/1.

Calyx : inflated 2 : subinflated 74 : narrow 1 ; anthocyanin much 1 : medium 70 : little 6.

Corolla : Marguerite Yellow 23 : white 54 ; petals entire 10 : bilobed 66 ; emarginate 34 : 1/4-lobing 2 : 1/3 lobing 10 : 1/2 lobing 12 : 2/3-lobing 4 : 3/4-lobing 5 ; boss 41 : none 36 ; anthocyanin blotch present 1 : absent 76 ; petals not overlapping 77 ; segments not overlapping 77.

Sex : hermaphrodite 16 : hermaphrodite and female 1 : female 60.

Androecium : filaments purple 12 : white 5 ; anthers purple 17 ; non-polliniferous anthers 16 ; petaloid staminodes 6.

Gynoecium : stigmata purple 71 : white 6 ; immature seeds purple 77.

Capsules : *S. maritima* type 77.

Mature seeds : armadillo 30 : weak armadillo 47.

Sterility : seed setting was better than in N. 146 but reproductive capacity was low from controlled selfings.

N. 147 plant	Total seeds	Capsules in which seeds counted	Average per capsule
8	128	17	7·5
2	169	25	6·8
7	164	22	7·5
6 x 7	220	10	22·0
N. 147/6 x N. 104/10	141	5	28·2
N. 147/6 x N. 104/11	69	3	23·0

N. 147 plant 8 had medium anthocyanin in vegetative parts ; 10 flowers ; calyx subinflated with medium anthocyanin ; petals white, bilobed, 2/3 to 3/4-lobing, boss, blotch absent ; hermaphrodite ; filaments white ; no non-polliniferous anthers and no petaloid staminodes ; stigmata purple ; mature seeds weak armadillo.

N. 147 plant 2 had medium anthocyanin in vegetative parts ; 7 flowers ; calyx inflated with medium anthocyanin ; petals white, bilobed, 2/3 to 3/4-lobing, boss, blotch absent ; hermaphrodite ; filaments purple ; no non-polliniferous anthers and no petaloid staminodes ; stigmata purple ; mature seeds weak armadillo.

N. 147 plant 7 had medium anthocyanin in vegetative parts ; 7 flowers ; calyx inflated with medium anthocyanin ; petals white, bilobed, 2/3 to 3/4-lobing, boss, blotch absent ; hermaphrodite ; filaments white ; no non-polliniferous anthers or petaloid staminodes ; stigmata purple ; mature seeds weak armadillo.

N. 147 plant 6 had medium anthocyanin in vegetative parts ; 7 flowers ; subinflated calyx with medium anthocyanin ; petals white, entire, no boss, blotch absent ; female ; stamens intermediate between vestigial and petaloid ; stigmata purple ; mature seeds armadillo.

N. 104, a selfing of S.P. 70, was described in K.B. 1939, 298. The parent and the family of 126 plants were all typical *S. maritima* and S.P. 70 bred true for all characters of specific value and for most intraspecific variables as well—especially for long cylindric calyces.

N. 104 plant 10 had petals and segments both overlapping ; N. 104 plant 11 had petals overlapping and segments not overlapping ; both had petals multilobed, anthocyanin blotch absent, filaments white, hermaphrodite flowers, purple stigmata, armadillo seeds. These characters are those of S.P. 70 except that the latter had a trace of anthocyanin in the filaments.

N. 268=N. 147 plant 8 selfed. 15 plants in the family.

Habit : suberect 13, prostrate and spreading to subspreading 2 ; some overwintering barren shoots, but mostly die back ; stems up to 5·0 dm. *Surface* : all glabrous, all mat.

Leaves : M 2 : HM 4 : MH 9.

Anthocyanin in vegetative parts : much 1 : medium 14.

Inflorescence : number of flowers 3/2, 6/1, 7/7, 9/1, 11/2, 12/1, 15/1.

Calyx : subinflated 6 : long subinflated 3 : long cylindric 6 ; anthocyanin medium 11 : little 4.

Corolla : Marguerite Yellow 1 : white 14 ; petals bilobed 13 : multilobed 2 ; entire to emarginate 1 : emarginate 2 : 1/4-lobing 1 ; 1/3 to 2/3-lobing 1 : 1/2-lobing 2 : 1/2 to 2/3-lobing 1 : 2/3-lobing 2 : 3/4-lobing 5 ; boss 13 : none 2 ; anthocyanin blotch absent 15 ; petals overlapping 7 : not overlapping 8 ; segments not overlapping 15.

Sex : hermaphrodite 2 : hermaphrodite and female 4 : female 9.

Androecium : filaments purple 1 : white 5 ; anthers purple 6 ; with nonpolliniferous anthers 1 ; petaloid staminodes 0.

Gynoecium : stigmata purple 15 ; immature seeds purple 14 : white 1.

Capsules : *S. maritima* type 10.

Mature seeds : armadillo 1 : weak armadillo 6 : weak tubercled 3.

Sterility : occurred with open pollination.

N. 269=N. 147 plant 3 selfed. 36 plants in the family.

Habit : suberect and spreading 9, subprostrate and spreading 27 ; stems up to 3·9 dm.

Surface : all glabrous, all mat.

Leaves : M 5 : HM 22 : MH 5 : GH 3 : HG 1.

Anthocyanin in vegetative parts : much 2 : medium 34.

Inflorescence : number of flowers 3/5, 4/1, 5/1, 6/3, 7/20, 8/3, 9/2, 10/1.

Calyx : large inflated 18 : subinflated 14 : long subinflated 3 : long cylindric 1 ; anthocyanin much 6 : medium 26 : little 4.

Corolla : Marguerite Yellow 16 : white 20 ; petals bilobed 35 : multilobed 1 ; entire to emarginate 3 : entire to 1/3-lobing 1 ; emarginate 1 : 1/3-lobing 7 : 1/3 to 1/2-lobing 2 : 1/2-lobing 3 : 1/2 to 2/3-lobing 1 : 2/3-lobing 9 : 3/4-lobing 9 ; boss 31 : none 5 ; anthocyanin blotch present 3 : absent 33 ; petals overlapping 21 : not overlapping 15 ; segments not overlapping 36.

Sex : hermaphrodite 3 : hermaphrodite and female 3 : female 30.

Androecium : filaments purple 5 : white 1 ; anthers purple 6 ; with non-polliniferous anthers 12 ; petaloid staminodes 2.

Gynoecium : stigmata purple 35 : white 1 ; immature seeds purple 32 : white 3.

Capsules : *S. maritima* type 27 : hybrid type 3.

Mature seeds : armadillo 9 : weak armadillo 20 : tubercled 1.

Sterility : occurred irregularly with open pollination.

N. 278=N. 147 plant 7 selfed. 4 plants in the family.

Habit : subprostrate and spreading 4 ; no overwintering barren shoots ; stems up to 3·5 dm.

Surface : all glabrous, all mat.

Leaves : M 1 : MH 2 : H 1.

Anthocyanin in vegetative parts : medium 4.

Calyx : large inflated 1 : subinflated 2 : long subinflated 1 ; anthocyanin medium 4.

Corolla : Marguerite Yellow 1 : white 3 ; petals bilobed 4 ; 2/3-lobing 2 ; 2/3 to 3/4-lobing 1 ; 3/4-lobing 1 ; boss 4 ; anthocyanin blotch absent 4 ; petals overlapping 1 : not overlapping 3 ; segments not overlapping 4.

Sex : hermaphrodite 1 : female 3.

Androecium : filaments purple 1 ; anthers purple 1 ; non-polliniferous anthers 0 ; petaloid stamens 0.

Gynoecium : stigmata purple 4 ; immature seeds purple 4.

Capsules : *S. maritima* type 1.

Mature seeds : armadillo 1.

Sterility : much with open pollination.

N. 300=N. 147 plant 6 x N. 147 plant 7. 29 plants in the family.

Habit : suberect 4 : subprostrate and spreading 25 ; no overwintering barren shoots ; stems up to 4·3 dm.

Surface : all glabrous, all mat.

Leaves : M 2 : HM 13 : MH 12 : GH 1 : HG 1.

Anthocyanin in vegetative parts : much 1 : medium 28.

Inflorescence : number of flowers 3/5, 5/2, 6/1, 7/20, 11/1.

Calyx : large inflated 7 : inflated 3 : subinflated 11 : long subinflated 4 : long cylindric 4 ; anthocyanin much 4 : medium 25.

Corolla : Marguerite Yellow 12 : white 17 ; petals entire 1 : bilobed 26 ; multilobed 2 ; entire 1, entire to emarginate 1, entire to 1/4-lobing 2, entire to 1/3-lobing 2, emarginate 3, emarginate to 1/4-lobing 1, emarginate to 1/3-lobing 1, 1/4-lobing 2, 1/4 to 1/2-lobing 1, 1/3-lobing 1, 1/3 to 1/2-lobing 2, 1/3 to 2/3-lobing 3, 1/2-lobing 3, 1/2–2/3-lobing 3, 2/3-lobing 2, 2/3 to 3/4-lobing 1 ; boss 20 : none 9 ; anthocyanin blotch absent 29 ; petals overlapping 17 : not overlapping 11 ; segments not overlapping 27.

Sex : hermaphrodite 4 : hermaphrodite and female 9 : female 16.

Androecium : filaments purple 8 : white 5 ; anthers purple 13 ; non-polliniferous anthers 5 ; petaloid staminodes 5.

Gynoecium : stigmata purple 26 : white 3 ; immature seeds purple 24 : white 4.

Capsules : *S. maritima* type 28.

Mature seeds : armadillo 21 : weak armadillo 6.

Sterility : not marked with open pollination.

N. 271=N. 147 plant 6 x N. 104 plant 10. 67 plants in the family.

Habit : suberect and spreading 8 : subprostrate and spreading 59 ; some overwintering barren shoots, but mostly die back ; stems up to 3·7 dm.

Surface : all glabrous, all mat.

Leaves : M 21 : HM 37 : MH 8.

Anthocyanin in vegetative parts : much 6 : medium 61.

Inflorescence : number of flowers 2/1, 3/24, 4/6, 5/7, 7/29.

Calyx : inflated 24 : subinflated 6 : long subinflated 9 : long cylindric 28 ; anthocyanin much 6 : medium 61.

Corolla : Marguerite Yellow 36 : white 31 ; petals entire 3 : bilobed 59 : multilobed 5 ; entire 3 : entire to emarginate 4 : entire to 1/4-lobing 3 : emarginate 8 : emarginate to 1/4-lobing 2 : emarginate to 1/3-lobing 2 : emarginate to 3/4-lobing 1 : 1/4-lobing 6 : 1/4 to 1/3-lobing 3 : 1/4 to 1/2-lobing 3 : 1/4 to 2/3-lobing 2 : 1/4 to 3/4-lobing 3 : 1/3-lobing 1 : 1/3 to 1/2-lobing 4 : 1/3 to 2/3-lobing 2 : 1/3 to 3/4-lobing 3 : 1/2-lobing 3 : 1/2 to 2/3-lobing 6 : 1/2 to 3/4-lobing 2 : 2/3-lobing 3 : 2/3 to 3/4-lobing 2 ; small scale 5 : boss 49 : none 13 ; anthocyanin blotch present 1 : absent 66 ; petals overlapping 55 : not overlapping 12 ; segments overlapping 2 : not overlapping 62.

Sex : hermaphrodite 10 : hermaphrodite and female 24 : female 33.

Androecium : filaments purple 18 : white 15 ; anthers purple 33 ; non-polliniferous anthers 4 ; petaloid staminodes 11.

Gynoecium : stigmata purple 57 ; immature seeds purple 57.

Capsules : *S. maritima* type 65.

Mature seeds : armadillo 65.

Sterility : not marked with open pollination.

N. 307=N. 147 plant 6 x N. 104 plant 11. 16 plants in the family.

Habit : suberect and spreading 6 : subprostrate and spreading 10 ; some overwintering barren shoots, but mostly die back ; stems up to 4·2 dm.

Surface : all glabrous, all mat.

Leaves : HM 5 : MH 10 : GH 1.

Anthocyanin in vegetative parts : medium 15 : little 1.

Inflorescence : number of flowers 4/4, 5/2, 6/3, 7/7.

Calyx : large inflated 12 : subinflated 3 : long cylindric 1 ; anthocyanin medium 16.

Corolla : Marguerite Yellow 9 : white 7 ; petals entire 4 : bilobed 11 : multilobed 1 ; entire 4 : entire to emarginate 4 : emarginate 3 : 1/3-lobing 3 : 2/3-lobing 2 ; boss 12 : none 4 ; anthocyanin blotch present 4 : absent 12 ; petals overlapping 14 : not overlapping 2 ; segments not overlapping 12.

Sex : hermaphrodite 1 : hermaphrodite and female 1 : female 14.

Androecium : filaments purple 2 ; anthers purple 2 ; non-polliniferous anthers 3 ; petaloid staminodes 3.

Gynoecium : stigmata purple 16 ; immature seeds purple 16.

Capsules : *S. maritima* type 16.

Mature seeds : armadillo 16.

Sterility : not marked with open pollination.

N. 148 = *S. glareosa* emarginate variant K. 1099 plant 41 x *S. maritima* S.P.A. 15. 77 plants in the family.

Habit : all spreading and prostrate ; no overwintering barren shoots except a little green in 21 plants ; stems up to 4·0 dm.

Surface : all glabrous and mat.

Leaves : all about intermediate but with some range in breadth and nearer to S.P.A. 15.

Anthocyanin in vegetative parts : much 52 : medium 25.

Inflorescence : number of flowers 3/5, 4/6, 5/3, 6/2, 7/58, 8/1, 10/1, 12/1, 13/1.

Calyx : subinflated 61 : narrow-clyndric 16 ; anthocyanin medium 71 : little 6.

Corolla : Marguerite Yellow 11 : white 66 ; bilobed 74 : multilobed 3 ; petals emarginate 21 : 1/4-lobing 8 : 1/3-lobing 6 : 1/2-lobing 16 : 2/3-lobing 11 : 3/4-lobing 15 ; small scale 1 : boss 60 : none 11 ; anthocyanin blotch present 31 : absent 46 ; petals overlapping 1 : not overlapping 76 ; segments not overlapping 77.

Sex : hermaphrodite 43 : female 34.

Androecium : filaments purple 34 : white 9 ; anthers purple 43 ; with non-polliniferous anthers 15 ; petaloid staminodes 2.

Gynoecium : stigmata purple 65 : white 12 ; immature seeds purple 77.

Capsules : *S. maritima* type 76.

Mature seeds : armadillo 25 : weak armadillo 51.

Sterility : little occurred with open pollination. With controlled pollinations the following results were obtained.

N. 148 plant	Total seeds	Capsules in which seeds counted	Average per capsule	Plants raised
37	372	37	10·1	61
47	254	29	8·8	27
59	405	14	28·9	32
57	303	24	12·2	43
52	334	17	19·7	11

N. 148 plant 37 had anthocyanin in vegetative parts medium ; 7 flowers ; calyx subinflated with medium anthocyanin ; petals white, bilobed, 1/3 to 2/3-lobing, boss, no blotch ; hermaphrodite ; filaments white ; stigmata white ; mature seeds weak armadillo.

N. 148 plant 47 had anthocyanin in vegetative parts much ; 7 flowers ; calyx subinflated with medium anthocyanin ; petals white, bilobed, 2/3 to 3/4-lobing, boss, blotch present ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds weak armadillo.

N. 148 plant 59 had anthocyanin in vegetative parts medium ; 7 flowers ; calyx subinflated with little anthocyanin ; petals white, bilobed, 1/2 to 2/3-lobing, boss, blotch present ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds weak armadillo.

N. 148 plant 57 had anthocyanin in vegetative parts much ; 7 flowers ; calyx narrow-cylindric with medium anthocyanin ; petals white, bilobed, 1/2-lobing, boss, blotch present ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds weak armadillo.

N. 148 plant 52 had anthocyanin in vegetative parts much ; 7 flowers ; calyx subinflated with medium anthocyanin ; petals white, bilobed, emarginate to 1/2-lobing, boss, blotch absent ; hermaphrodite ; filaments purple ; stigmata purple ; mature seeds armadillo.

S.P.A. 15, a narrow-leaved *S. maritima*, was described in K.B. 1929, 151. It had very much anthocyanin in vegetative parts and calyx ; calyx narrow-cylindric ; petals overlapping and segments not overlapping, scale, blotch present, hermaphrodite, stigmata white, immature seeds purple, mature seeds armadillo.

N. 272=N. 148 plant 37 selfed. 61 plants in the family.

Habit : suberect and subspreading 25 : subprostrate and subspreading 34 ; some overwintering barren shoots, but mostly die back ; stems up to 3·0 dm.

Surface : all glabrous and mat.

Leaves : M 3 : HM 13 : MH 24 : H 7 : GH 2 : HG 2 : G 1 and, in addition, 4 with shorter and broader leaves.

Anthocyanin in vegetative parts : much 19 : medium 40 : little 2.

Inflorescence : number of flowers 2/1, 3/26, 4/5, 5/4, 6/5, 7/18.

Calyx : subinflated 40 : narrow-cylindric 21 ; anthocyanin much 2 : medium 58 : little 1.

Corolla : Marguerite Yellow 21 : white 39 ; petals entire 7 : bilobed 51 : multilobed 1 ; entire 7 : entire to emarginate 3 : emarginate 9 : emarginate to 1/3-lobing 6 : 1/3-lobing 11 : 1/3 to 1/2-lobing 3 : 1/2-lobing 9 : 2/3-lobing 9 : 2/3 to 3/4-lobing 1 : 3/4-lobing 2 ; small scale 1 : boss 44 : none 15 ; anthocyanin blotch present 10 : absent 50 ; petals overlapping 28 : not overlapping 32 ; segments not over-lapping 41.

Sex : hermaphrodite 12 : hermaphrodite and female 3 : female 46.

Androecium : filaments white 15 ; anthers purple 15 ; non-polliniferous anthers 2 ; petaloid staminodes 6.

Gynoecium : stigmata purple 44 : white 17 ; immature seeds purple 35 : white 16.

Capsules : *S. maritima* type 40.

Mature seeds : armadillo 18 : weak armadillo 22.

Sterility : considerable with open pollination.

N. 273=N. 148 plant 47 selfed. 27 plants in the family.

Habit : suberect and subspreading 1 : prostrate, ascending at ends, and sub-spreading 26 ; some overwintering barren shoots, but mostly die back ; stems up to 3·7 dm.

Surface : all glabrous and mat.

Leaves : M 1 : HM 11 : MH 11 : H 4.

Anthocyanin in vegetative parts : much 22 : medium 5.

Inflorescence : number of flowers 2/3, 3/4, 4/5, 5/4, 6/2, 7/8.

Calyx : inflated 1 : subinflated 7 : narrow-cylindric 16 ; anthocyanin much 1 : medium 23.

Corolla : Marguerite Yellow 5 : white 19 ; petals bilobed 25 ; emarginate 1 : emarginate to 1/3-lobing 1 : 1/3-lobing 2 : 1/3 to 1/2-lobing 3 : 1/2-lobing 2 : 1/2 to 2/3-lobing 1 : 2/3-lobing 5 : 3/4-lobing 10 ; scale 1 : small scale 5 : boss 14 : none 5 ; anthocyanin blotch present 18 : absent 7 ; petals overlapping 22 : not overlapping 3 ; segments not overlapping 24.

Sex : hermaphrodite 7 : hermaphrodite and female 2 : female 16.

Androecium : filaments purple 2 : white 7 ; anthers purple 9 ; non-polliniferous anthers 9 ; petaloid staminodes 4.

Gynoecium : stigmata purple 15 : white 10 ; immature seeds purple 11 : white 9.

Capsules : *S. maritima* type 10.

Mature seeds : armadillo 6 : weak armadillo 4.

Sterility : very considerable with open pollination.

N. 282=N. 148 plant 59 selfed. 32 plants in the family.

Habit : suberect and subspreading 2 : prostrate, ascending at ends, and subspreading 30 ; overwintering shoots present in good numbers ; stems up to 3·4 dm.

Surface : all glabrous and mat.

Leaves : HM 18 : MH 8 : H 3 : GH 2 : HG 1.

Anthocyanin in vegetative parts : much 31 : medium 1.

Inflorescence : number of flowers 3/6, 4/2, 6/3, 7/17, 9/1, 10/1, 11/1.

Calyx : subinflated 15 : narrow-cylindric 16 ; anthocyanin medium 20 : little 11.

Corolla : Marguerite Yellow 12 : white 19 ; petals bilobed 31 ; emarginate 5 : emarginate to 1/3-lobing 1 : 1/3-lobing 4 : 1/3 to 2/3-lobing 1 : 1/2-lobing 2 : 1/2 to 2/3-lobing 1 : 2/3-lobing 10 : 2/3 to 3/4-lobing 1 : 3/4-lobing 6 ; small scale 1 : boss 28 : none 2 ; anthocyanin blotch present 16 : absent 15 ; petals overlapping 31 ; segments not overlapping 26.

Sex : hermaphrodite 18 : hermaphrodite and female 2 : female 8.

Androecium : filaments purple 11 : white 9 ; anthers purple 20 ; nonpolliniferous anthers 4 ; petaloid staminodes 1.

Gynoecium : stigmata purple 23 : white 8 ; immature seeds purple 14 : white 8.

Capsules : *S. maritima* type 27.

Mature seeds : armadillo 10 : weak armadillo 14.

Sterility : some with open pollination.

N. 283=N. 148 plant 57 selfed. 43 plants in the family.

Habit : suberect and subspreading 43 ; some overwintering barren shoots, but mostly die back ; stems up to 3·7 dm.

Surface : all glabrous and mat.

Leaves : M 11 : HM 28 : MH 4.

Anthocyanin in vegetative parts : much 39 : medium 4.

Inflorescence : number of flowers 3/15, 4/1, 5/3, 6/4, 7/17, 8/1, 9/1, 10/1.

Calyx : subinflated 1 : narrow-cylindric 42 ; anthocyanin much 14 : medium 28 : little 1.

Corolla : Marguerite Yellow 8 : white 35 ; petals entire 3 : bilobed 37 : multilobed 1 ; entire 3 : entire to emarginate 2 : emarginate 19 : emarginate to 1/4-lobing 1 : 1/4 to 1/2-lobing 1 : 1/3-lobing 4 : 1/2-lobing 8 : 1/2 to 2/3-lobing 1 : 2/3-lobing 1 : 2/3 to 3/4-lobing 1 : 3/4-lobing 2 ; small scale 2 : boss 25 : none 16 ; anthocyanin blotch present 12 : absent 31 ; petals overlapping 41 : not overlapping 2 ; segments not overlapping 40.

Sex : hermaphrodite 13 : female 30.

Androecium : filaments purple 10 : white 3 ; anthers purple 13 ; nonpolliniferous anthers 6 ; petaloid staminodes 5.

Gynoecium : stigmata purple 40 : white 3 ; immature seeds purple 32 : white 7.

Capsules : *S. maritima* type 34.

Mature seeds : armadillo 16 : weak armadillo 16.

Sterility : considerable with open pollination.

N. 320=N. 148 plant 52 selfed. 11 plants in the family.

Habit : suberect and subspreading 11 ; no overwintering barren shoots ; stems up to 2·5 dm.

Surface : all glabrous and mat.

Leaves : M 6 : HM 4 : MH 1.

Anthocyanin in vegetative parts : much 3 : medium 6 : little 2.

Inflorescence : number of flowers 3/2, 5/2, 7/6.

Calyx : subinflated 10 : narrow-cylindric 1 ; anthocyanin medium 11.

Corolla : Marguerite Yellow 6 : white 5 ; petals entire 2 : bilobed 9 ; entire 2 : entire to emarginate 1 : entire to 1/3-lobing 1 : emarginate 4 : 1/2-lobing 2 : 1/3-lobing 1 ; small scale 1 : boss 2 : none 8 ; anthocyanin blotch present 1 : absent 10 ; petals not overlapping 11 ; segments not overlapping 9.

Sex : hermaphrodite 2 : female 9.

Androecium : filaments purple 1 : white 1 ; anthers purple 2 ; non-polliniferous anthers 0 ; petaloid staminodes 8.

Gynoecium : stigmata purple 6 : white 5 ; immature seeds purple 5 : white 4.

Capsules : *S. maritima* type 8.

Mature seeds : armadillo 8.

Sterility : much in open pollination.

N. 149=*S. glareosa* emarginate variant K. 1099 plant 41 x *S. maritima* N. 18 plant 11. 89 plants in the family.

Habit : all prostrate and spreading ; no overwintering barren shoots, except a little green showing in 25 plants ; stems up to 4·5 dm.

Surface : all glabrous and mat.

Leaves : intermediate but nearer to N. 18 plant 11.

Anthocyanin in vegetative parts : little 89.

Inflorescence : number of flowers 5/2, 7/77, 8/3, 9/3, 10/2, 14/2.

Calyx : inflated 1 : subinflated 6 : narrow-cylindric 2 ; anthocyanin medium 3 : little 86.

Corolla : Marguerite Yellow 22 : white 67 ; petals bilobed 88 ; emarginate 9 : 1/4-lobing 23 : 1/3-lobing 3 : 1/2-lobing 14 : 2/3-lobing 22 : 3/4-lobing 18 ; scale 2 : small scale 20 : boss 50 : none 17 ; blotch absent 89 ; petals not overlapping 89 ; segments not overlapping 89.

Sex : hermaphrodite 31 : hermaphrodite and female 11 : female 47.

Androecium : filaments purple 22 : white 19 ; anthers purple 1 : yellow-green 40 ; non-polliniferous anthers 3 ; petaloid staminodes 4.

Gynoecium : stigmata purple 73 : white 16 ; immature seeds purple 88.

Capsules : *S. maritima* type 85.

Mature seeds : armadillo 41 : weak armadillo 44.

Sterility : not marked with open pollination.

From controlled selfings the results were :

N. 149 plant	Total seeds	Capsules in which seeds counted	Average per capsule	Plants raised
10	60	14	4·3	14
4	66	18	3·7 ...	13
34 x N.18/11	109	18	6·1	49
4 x N.18/11	31	10	3·1	10
7 x N.18/11	33	8	4·1	10
10 x N.156/2	113	13	8·7	21
34 x N.156/2	63	10	6·3	28
7 x N.148/52	88	19	4·6	18

N. 149 plant 10 had 9 flowers ; calyx inflated with little anthocyanin ; petals white, 1/2 to 3/4-lobing, small scale ; hermaphrodite ; filaments white ; anthers yellow-green ; stigmata white ; seeds weak armadillo.

N. 149 plant 4 had 7 flowers ; calyx subinflated with little anthocyanin ; petals white, emarginate to 1/2-lobing, boss ; hermaphrodite ; filaments white ; anthers yellow-green ; stigmata white ; seeds armadillo.

N. 149 plant 34 had 7 flowers ; calyx subinflated with little anthocyanin ; petals Marguerite Yellow, emarginate to 1/4-lobing, no corona ; female ; petaloid staminodes ; stigmata purple ; seeds armadillo.

N. 149 plant 7 had 7 flowers ; calyx subinflated with little anthocyanin ; petals Marguerite Yellow, emarginate, no corona ; female ; petaloid staminodes ; stigmata purple ; seeds armadillo.

N. 18=S.P.A. 20 selfed (see K.B. 1929, 153 ; K.B. 1932, 231).

N. 18 plant 11 had no anthocyanin except in immature seeds ; calyx narrow-ellipsoid ; petals white, 3/4-lobing, small scale, no blotch, petals and segments not overlapping ; mature seeds armadillo.

N. 156=N. 18 plant 11 selfed.

N. 156 plant 2 had vegetative characters as parent, no anthocyanin in any part of plant except in immature seeds, calyx narrow ellipsoid, bilobed petals with 3/4-lobing, scale, no blotch, petals and segments not overlapping, hermaphrodite, seeds armadillo.

N. 270=N. 149 plant 10 selfed. 13 plants in the family.

Habit : compact base, 3 with erect, 7 with suberect, and 3 with prostrate stems ; overwintering barren shoots present in considerable numbers ; stems up to 2·9 dm.

Surface : all glabrous and mat.

Leaves : M 5 : HM 1 : MH 5 : H 2.

Anthocyanin in vegetative parts : medium 4 : little 4 : none 5.

Inflorescence : number of flowers 7/9, 8/2, 12/1, 15/1.

Calyx : large inflated 2 : inflated 1 : subinflated 10 ; anthocyanin medium 8 : none 5.

Corolla : Marguerite Yellow 2 : white 11 ; petals bilobed 13 ; 1/3-lobing 3 : 1/2-lobing 5 : 2/3-lobing 3 : 3/4-lobing 2 : scale 1 : small scale 2 : boss 8 : none 2 ; blotch absent 13 ; petals overlapping 10 ; not overlapping 3 ; segments not overlapping 12.

Sex : hermaphrodite and female 1 : female 12.

Androecium : filaments white 1 ; anthers purple 1 ; non-polliniferous anthers 3 ; petaloid staminodes 1.

Gynoecium : stigmata purple 6 : white 7 ; immature seeds purple 8 : white 2.

Capsules : *S. maritima* type 1.

Mature seeds : weak armadillo 1.

Sterility : complete with open pollination.

N. 321=N. 149 plant 4 selfed. 13 plants in the family.

Habit : compact base 11, loose base 2, suberect stems 9, prostrate 4 ; overwintering barren shoots present in considerable numbers ; stems up to 3·9 dm.

Surface : all glabrous and mat.

Leaves : M 2 : HM 6 : MH 4 : H 1.

Anthocyanin in vegetative parts : medium 5 : little 3 : none 5.

Inflorescence : number of flowers 3/3, 7/10.

Calyx : large inflated 1 : subinflated 11 : narrow-cylindric 1 ; anthocyanin medium 6 : little 3 : none 4.

Corolla : white 13 ; bilobed 10 : multilobed 1 ; petals entire to emarginate 2 : emarginate 2 : emarginate to 2/3-lobing 1 : 1/4 to 1/3-lobing 1 : 1/4 to 1/2-lobing 1 : 1/3 to 2/3-lobing 1 : 1/2 to 2/3-lobing 2 : 2/3 to 3/4-lobing 1 : 3/4-lobing 2 ; small scale 3 : boss 6 : none 4 ; blotch present 1 : absent 11 ; petals not overlapping 13 ; segments overlapping 2 : not overlapping 7.

Sex : female 13.

Androecium : non-polliniferous anthers 7 ; petaloid staminodes 2.

Gynoecium : stigmata purple 7 : white 6 ; immature seeds purple 10 : white 2.

Capsules : *S. maritima* type 11.

Mature seeds : armadillo 10.

Sterility : very considerable with open pollination.

N. 281=N. 149 plant 34 x N. 18 plant 11. 48 plants in the family.

Habit : compact base 45, loose base 3, erect stems 1, suberect 27, subprostrate 20 ; barren overwintering shoots present in considerable numbers ; stems up to 5·0 dm.

Surface : all glabrous and mat.

Leaves : M 10 : HM 13 : MH 19 : H 3 : GH 3.

Anthocyanin in vegetative parts : little 18 ; none 30.

Inflorescence : number of flowers 3/15, 4/2, 5/2, 6/2, 7/27.

Calyx : inflated 1 : subinflated 40 : narrow-cylindric 2 ; anthocyanin medium 8 : little 11 : none 29.

Corolla : white 48 ; petals bilobed 46 : multilobed 2 ; entire to 1/3-lobing 1 : emarginate 2 : emarginate to 1/2-lobing 1 : emarginate to 2/3-lobing 1 : 1/4 to 1/3-lobing 1 : 1/4 to 1/2-lobing 2 : 1/4 to 2/3-lobing 2 : 1/3 to 1/2-lobing 2 : 1/3 to 2/3-lobing 2 : 1/3 to 3/4-lobing 2 : 1/2 to 2/3-lobing 8 : 2/3-lobing 2 : 2/3 to 3/4-lobing 15 : 3/4-lobing 7 ; small scale 12 : boss 34 : none 2 ; blotch absent 48 ; petals overlapping 19 : not overlapping 29 ; segments overlapping 7 : not overlapping 41.

Sex : hermaphrodite 1 : female 47.

Androecium : filaments white 1 ; anthers purple 1 ; non-polliniferous anthers 17 : petaloid staminodes 10.

Gynoecium : stigmata purple 19 : white 29 ; immature seeds purple 44 : white 1.

Capsules : *S. maritima* type 41.

Mature seeds : armadillo 40.

Sterility : not marked in open pollination.

N. 291=N. 149 plant 4 x N. 18 plant 11. 10 plants in the family.

Habit : compact base 7, loose base 3, suberect stems 7, subprostrate 3 ; barren overwintering shoots present in considerable numbers ; stems up to 4·5 dm.

Surface : all glabrous and mat.

Leaves : M 5 : HM 1 : MH 2 : H 1 : HG 1.

Anthocyanin in vegetative parts : medium 3 : little 1 : none 6.

Inflorescence : number of flowers 3/5, 5/1, 6/2, 7/1, 9/1.

Calyx : inflated 6 : subinflated 4 ; anthocyanin medium 3 : little 1 : none 6.

Corolla : white 10 ; petals bilobed 7 : multilobed 3 ; emarginate 1 : 1/4 to 2/3-lobing 1 : 1/3 to 1/2-lobing 1 : 1/2 to 2/3-lobing 3 : 1/2 to 3/4-lobing 1 : 2/3 to 3/4-lobing 2 : 3/4-lobing 1 ; small scale 2 : boss 5 : none 3 ; blotch absent 9 : present 1 ; petals overlapping 7 : not overlapping 3 ; segments not overlapping 9.

Sex : female 10.

Androecium : non-polliniferous anthers 3 ; petaloid staminodes 1.

Gynoecium : stigmata purple 4 : white 6 ; immature seeds purple 8 : white 1.

Capsules : *S. maritima* type 9.

Mature seeds : armadillo 9.

Sterility : not marked in open pollination.

N. 305=N. 149 plant 7 x N. 18 plant 11. 10 plants in the family.

Habit : compact base 5, loose 5, suberect stems 6, subprostrate stems 4 ; overwintering barren shoots present in considerable numbers ; stems up to 4·2 dm.

Surface : all glabrous and mat.

Leaves : M 4 : HM 3 : MH 2 : H 1.

Anthocyanin in vegetative parts : little 7 : none 3.

Inflorescence : number of flowers 4/1, 7/7, 8/1, 15/1.

Calyx : large inflated 1 : inflated 3 : subinflated 6 ; anthocyanin medium 7 : none 3.

Corolla : white 10 ; petals bilobed 10 ; emarginate to 1/4-lobing 1 : 1/4-lobing 1 : 1/4 to 1/2-lobing 1 : 1/3 to 1/2-lobing 1 : 1/3 to 3/4-lobing 1 : 1/2-lobing 1 : 1/2 to 3/4-lobing 1 : 2/3 to 3/4-lobing 3 ; scale 2 : small scale 1 : boss 6 : none 1 ; blotch absent 10 ; petals overlapping 2 : not overlapping 8 ; segments not overlapping 10.

Sex : hermaphrodite and female 1 : female 9.

Androecium : filaments purple 1 ; anthers yellow-green 1 ; non-polliniferous anthers 3 ; petaloid staminodes 2.

Gynoecium : stigmata purple 7 : white 3 ; immature seeds purple 10.

Capsules : *S. maritima* type 10.

Mature seeds : armadillo 10.

Sterility : not marked in open pollination.

N. 303=N. 149 plant 10 x N.156 plant 2. 21 plants in the family.

Habit : compact base 4, loose 17, suberect 15, subprostrate 5, prostrate 1 ; overwintering barren shoots present in considerable numbers ; stems up to 3·5 dm.

Surface : all glabrous and mat.

Leaves : M 7 : HM 6 : MH 7 : H 1.

Anthocyanin in vegetative parts : little 14 : none 7.

Inflorescence : number of flowers 3/2, 4/3, 5/3, 6/2, 7/9, 8/1, 12/1.

Calyx : large inflated 5 : inflated 10 : subinflated 6 ; anthocyanin little 14 : none 7.

Corolla : white 21 ; petals bilobed 21 ; emarginate to 1/3-lobing 1 : 1/4 to 3/4-lobing 1 : 1/2 to 2/3-lobing 2 ; 2/3 to 3/4-lobing 8 : 3/4-lobing 9 ; scale 2 : small scale 16 : boss 3 ; blotch present 1 : absent 20 ; petals overlapping 16 : not overlapping 5 ; segments overlapping 10 : not overlapping 11.

Sex : hermaphrodite 1 : female 20.

Androecium : filaments white 1 ; anthers purple 1 ; non-polliniferous anthers 15 ; petaloid staminodes 5.

Gynoecium : stigmata purple 13 : white 8 ; immature seeds purple 21.

Capsules : *S. maritima* type 21.

Mature seeds : armadillo 6 : weak armadillo 15.

Sterility : not marked in open pollination.

N. 312=N. 149 plant 34 x N. 156 plant 2. 28 plants in the family.

Habit : compact base 10, loose 18, suberect 15, subprostrate 12, prostrate 1 ; overwintering barren shoots present in considerable numbers ; stems up to 5·9 dm.

Surface : all glabrous and mat.

Leaves : M 4 : HM 10 : MH 6 : H 8.

Anthocyanin in vegetative parts : little 13 : none 15.

Inflorescence : number of flowers 2/2, 3/1, 4/1, 5/1, 6/1, 7/21, 8/8.

Calyx : inflated 11 : subinflated 17 ; anthocyanin medium 13 : none 15.

Corolla : white 28 ; petals bilobed 26 : multilobed 2 ; emarginate 1 : emarginate to 1/4-lobing 1 : 1/4 to 1/3-lobing 1 : 1/3-lobing 1 : 1/3 to 1/2-lobing 4 : 1/3 to 2/3-lobing 1 : 1/2-lobing 2 : 1/2 to 2/3-lobing 7 : 1/2 to 3/4-lobing 1 : 2/3-lobing 3 : 2/3 to 3/4-lobing 4 : 3/4-lobing 2 ; scale 1 : small scale 10 : boss 16 : none 1 ; blotch absent 28 ; petals overlapping 16 : not overlapping 12 ; segments overlapping 2 : not overlapping 26.

Sex : female 28.

Androecium : non-polliniferous anthers 7 ; petaloid staminodes 5.

Gynoecium : stigmata purple 13 : white 15 ; immature seeds purple 27.

Capsules : *S. maritima* type 20.

Mature seeds : armadillo 20.

Sterility : considerable with open pollination.

N. 315=N. 149 plant 7 x N. 148 plant 52. 18 plants in the family.

Habit : compact base 8, loose 10, erect 1, suberect 12, subprostrate 4 ; overwintering barren shoots present in considerable numbers ; stems up to 4·8 dm.

Surface : all glabrous and mat.

Leaves : M 1 : HM 3 : MH 6 : H 3 : GH 5.

Anthocyanin in vegetative parts : medium 8 : little 9 : none 1.

Inflorescence : number of flowers 5/2, 6/4, 7/7, 9/3, 13/1.

Calyx : large inflated 2 : inflated 4 : subinflated 11 ; anthocyanin medium 11 : little 6.

Corolla : Marguerite Yellow 5 : white 12 ; petals entire 3 : bilobed 10 ; multilobed 1 ; entire 3 : entire to emarginate 1 : emarginate 2 : emarginate to 1/4-lobing 2 : emarginate to 1/2-lobing 1 : 1/4 to 1/3-lobing 2 : 1/3 to 2/3-lobing 2 : 1/2 to 2/3-lobing 1 : 1/2 to 3/4-lobing 1 ; boss 7 : none 8 ; blotch present 1 : absent 16 ; petals overlapping 1 : not overlapping 16 ; segments not overlapping 11.

Sex : hermaphrodite 1 : hermaphrodite and female 1 : female 15.

Androecium : filaments purple 2 ; anthers purple 2 ; non-polliniferous anthers 2 ; petaloid staminodes 7.

Gynoecium : stigmata purple 8 : white 9 ; immature seeds purple 12 : white 5.

Capsules : *S. maritima* type 18.

Mature seeds : armadillo 18.

Sterility : not marked with open pollination.

N. 154=*S. glareosa* emarginate variant K. 1099 plant 41 x *S. vulgaris* (Loch Tay) S.P.B. 37. 63 plants in the family.

Habit : all spreading and subprostrate ; all died down with no over-wintering barren shoots except 11 showed a little green ; stems up to 5·0 dm.

Surface : all glabrous, all mat.

Leaves : more or less intermediate with a preponderance of *S. vulgaris* characters.

Anthocyanin in vegetative parts : medium 63.

Inflorescence : from 15 to 56 flowers.

Calyx : inflated 14 : subinflated 49 ; anthocyanin medium 63.

Corolla : Dy 24 : My 7 : Py 4 : MY 29 ; of the 31 Dy and My plants 14 had MY tips ; petals not multilobed ; entire 36 ; emarginate 18 : 1/3-lobing 4 : 1/2-lobing 5 ; boss 12 : no boss 51 ; no anthocyanin blotch present in the 29 MY plants ; petals and segments not overlapping 63.

Sex : hermaphrodite 1 : hermaphrodite and female 3 : female 59.

Androecium : filaments purple 4 : anthers purple 4 ; non-polliniferous anthers 4 ; petaloid staminodes 34.

Gynoecium : stigmata purple 63 ; immature seeds white 63.

Capsules : of intermediate type 58 : of *S. vulgaris* type 5.

Mature seeds : tubercled 1 : weak tubercled 5 : armadillo 38 : weak armadillo 19.

Sterility : not marked with open pollination.

With controlled pollination :

N. 154 plant	Total seeds	Capsules in which seeds counted	Average per capsule
25 selfed	330	12	27·5
23 x 25	132	3	44·0
49 x 25	67	2	33·5
28 x 25	143	4	35·75

N. 154 plant	Total seeds	Capsules in which seeds counted	Average per capsule
23 x N. 121/3	188	5	37·6
27 x N. 121/3	307	4	76·75
28 x N. 121/3	382	11	34·72
Selfings or crosses of which the seed was not viable :			
N. 297/5 selfed	36	3	12
N. 302/28 selfed	1	1	1
N. 313/49 selfed	86	2	43
N. 314/25 selfed	9	4	2·25
N. 279/32 x 25	101	3	33·66
N. 280/32 x 25	101	11	9·18
N. 292/27 x 25	254	5	50·8
N. 306/49 x 25	163	5	32·6
N. 308/27 x 25	405	10	40·5

N. 154 plant 25 had calyx subinflated, petals My, emarginate, no boss, hermaphrodite and female flowers, no petaloid staminodes, capsules intermediate, seeds armadillo.

N. 154 plant 23 had calyx inflated, petals MY, entire, no boss, female flowers, petaloid staminodes, capsules intermediate, seeds armadillo.

N. 154 plant 49 had calyx subinflated, petals Dy, entire, no boss, female flowers, petaloid staminodes, capsules intermediate, seeds armadillo.

N. 154 plant 28 had calyx subinflated, petals Py, 1/2 to 2/3-lobing, boss, female flowers, non-polliniferous anthers, capsules intermediate, seeds weak tubercled.

N. 154 plant 27 had calyx subinflated, petals Dy, entire, more or less acute, no boss, female flowers, petaloid staminodes, capsules of *S. vulgaris* type, seeds armadillo.

B. 37 (see K.B. 1940 p. 67) : *S. vulgaris* habit and leaves, compact, medium anthocyanin in vegetative parts, glabrous, up to 15 flowers, calyx subinflated with medium anthocyanin, petals bilobed, 3/4-lobing, petals and segments not overlapping, boss, colour M, hermaphrodite, filaments, anthers, and stigmata purple, immature seeds white, capsules *S. vulgaris* type, seeds tubercled.

N. 121 plant 3 : *S. vulgaris* habit and leaves, compact, medium anthocyanin in vegetative parts, glabrous, mat, up to 30 flowers, calyx subinflated with little anthocyanin, petals bilobed, 3/4-lobing, petals and segments not overlapping, boss, colour M, hermaphrodite, filaments, anthers, and stigmata purple, immature seeds white, capsules *S. vulgaris* type, seeds tubercled.

N. 277=N̄. 154 plant 25 selfed. 12 plants in the family.

Habit : erect 2 : suberect 10 ; spreading 10 : compact 2 ; no overwintering barren shoots ; stems up to 6·1 dm.

Surface : all glabrous, all mat.

Leaves : of *S. vulgaris* type, 2·8 cm. long and 0·6 cm. broad to 4·0 cm. long and 1·0 cm. broad.

Anthocyanin in vegetative parts : medium 12.

Inflorescence : 7 to 9 flowered.

Calyx : subinflated 12 ; anthocyanin medium 10 : little 2.

Petals : Dy 1 : My 9 : Py 1 : MY 1 ; 2 My had MY tips ; no petals multilobed ; entire 2 : entire to emarginate 1 : emarginate 1 : emarginate to 1/4-lobing 1 : 1/4-lobing 1 : 1/4 to 1/3-lobing 1 : 1/4 to 1/2-lobing 2 : 1/3 to 1/2-lobing 1 : 1/2-lobing 1 : 1/2 to 2/3-lobing 1 ; boss 8 : no boss 3 ; petals and segments not overlapping.

Sex : hermaphrodite 2 : hermaphrodite and female 3 : female 7.

Androecium : filaments purple 4 : white 1 ; anthers purple 5 ; non-polliniferous anthers 1 ; petaloid staminodes 2, in plant 2 they were My colour and the petals were entire and acute.

Gynoecium . stigmata purple 12 ; immature seeds white 12.

Capsules : *S. vulgaris* type 3 : intermediate type 8.

Mature seeds : armadillo 9.

Sterility : shown by some plants with open pollination.

Note. In the 1939–40 winter, out of 54 plants, 42 died.

N. 229=N. 154 plant 23 x N. 154 plant 25. 66 plants in the family.

Habit : erect 13 : suberect 51 : prostrate 1 ; spreading 2 : subspreading 51 : compact 12 ; no overwintering barren shoots ; stems up to 6·8 dm.

Surface : all glabrous and mat.

Leaves : G 3 : HG 6 : GH 29 : H 21 : VH 4 : HV 2 : V 1.

Anthocyanin in vegetative parts : much 3 : medium 42 : little 21.

Inflorescence : number of flowers 6/1, 7/2, 8/1, 9/2, 11/2, 12/4, 14/5, 15/6 16/2, 17/3, 18/5, 19/2, 20/4, 21/4, 22/2, 24/1, 25/4, 26/1, 27/2, 28/3, 30/1, 31/1, 33/4, 34/1, 38/1, 41/1.

Calyx : inflated 31 : subinflated 34 ; anthocyanin medium 36 : little 29.

Corolla : Dy 21 : My 14 : Py 1 : MY 26 : W 3 ; no petals multilobed ; entire 32 : emarginate 20 : 1/3-lobing 2 : 1/3 to 1/2-lobing 1 : 1/2-lobing 3 : 2/3-lobing 1 : 3/4-lobing 1 ; boss 12 : no boss 53 ;, two MY plants had anthocyanin blotch ; petals overlapping 3 : not overlapping 62 ; segments not overlapping ; plant 2 with entire petals had acute petals.

Sex : hermaphrodite 7 : hermaphrodite and female 8 : female 50.

Androecium : filaments purple 15 ; anthers purple 15 ; non-polliniferous anthers 5 ; petalid staminodes 14, 2 plants with Dy petals had Dy petaloid staminodes and one (plant 61) had some of the staminodes emarginate though the petals were entire, and 2 other plants with Dy petals had the petaloid staminodes tinged with colour at the tips ; and 1 plant with MY petals had the petaloid staminodes tinged with colour on the back.

Gynoecium : stigmata purple 65 ; immature seeds white 64.

Capsules : *S. maritima* type 10 : intermediate type 32 : *S. vulgaris* type 6.

Mature seeds : armadillo 48.

Sterility : not marked with open pollination.

N. 301=N. 154 plant 49 x N. 154 plant 25. 67 plants in the family.

Habit : erect 4 : suberect 62 ; spreading 60 : subcompact 1 : compact 5; no overwintering barren shoots ; stems up to 7·3 dm.

Surface : all glabrous and mat.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : medium 67.

Inflorescence : number of flowers 5 to 15.

Calyx : inflated 20 : subinflated 47 ; anthocyanin much 4 : medium 52 : little 11.

Corolla : Dy 29 : My 25 : MY 13 ; petals no multilobing ; entire 26 : entire to emarginate 3 : emarginate 9 : emarginate to 1/4-lobing 6 : emarginate to 3/4-lobing 1 : 1/4-lobing 1 : 1/4 to 1/3-lobing 7 : 1/4 to 1/2-lobing 1 : 1/4 to 2/3-lobing 1 : 1/3 to 1/2-lobing 2 : 1/3 to 2/3-lobing 1 : 1/3 to 3/4-lobing 2 : 1/2-lobing 2 : 1/2 to 2/3-lobing 2 : 2/3 to 3/4-lobing 1 ; boss 29 : no boss 38 ; 1 MY had anthocyanin blotch ; petals and segments not overlapping ; 9 plants with entire petals had acute petals ; 12 Dy or My plants had the petals tipped MY.

Sex : hermaphrodite 5 : hermaphrodite and female 14 : female 48.

Androecium : filaments purple 16 : white 3 ; anthers purple 19 ; non-polliniferous anthers 7 ; petaloid staminodes 19 ; 6 Dy and 6 My and 1 MY plants had colour in the staminodes ; 1 Dy and 2 My plants had staminodes with specks of colour.

Gynoecium : stigmata purple 60 : white 7 ; immature seeds white 67.

Capsules (37 samples only) : *S. vulgaris* type 9 : intermediate type 28.

Mature seeds : armadillo 40 : weak armadillo 1.

Sterility : shown by some plants with open pollination.

N. 304=N. 154 plant 28 x N. 154 plant 25. 50 plants in the family.

Habit : erect 9 : suberect 38 : subprostrate 3 ; spreading 30 : subspreading 1 : compact 11 : subcompact 8 ; no overwintering barren stems ; stems up to 6·7 dm.

Surface : all glabrous and mat.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : much 50.

Inflorescence : number of flowers 5 to 23.

Calyx : inflated 13 : subinflated 37 ; anthocyanin much 46 : little 4.

Corolla : Dy 14 : My 22 : Py 4 : MY 10 ; petals multilobed 4 ; entire 18 : entire to emarginate 2 : emarginate 6 : emarginate to 1/3-lobing 2 : emarginate to 1/4-lobing 3 : emarginate to 1/2-lobing 1 : 1/4-lobing 1 : 1/4 to 1/3-lobing 1 : 1/4 to 1/2-lobing 3 : 1/4 to 2/3-lobing 1 : 1/3 to 1/2-lobing 1 : 1/3 to 2/3-lobing 1 : 1/2 to 3/4-lobing 2 : 3/4-lobing 7 ; boss 23 : no boss 25 ; no anthocyanin blotch ; petals and segments not overlapping ; acute petals 8 ; 1 Dy and 3 My petals were tipped MY.

Sex : hermaphrodite 4 : hermaphrodite and female 8 : female 38.

Androecium : filaments purple 12 ; anthers purple 12 ; non-polliniferous anthers 12 ; petaloid staminodes 12 ; 2 Dy, 1 My, 1 Py, and 1 MY had colour in the staminodes.

Gynoecium : stigmata purple 50 ; immature seeds white 50.

Capsules : *S. vulgaris* type 15 : intermediate type 32.

Mature seeds : armadillo 33 : weak armadillo 14.

Sterility : occurred in some plants with open pollination.

N. 293=N. 154 plant 23 x N. 121 plant 3. 59 plants in the family.

Habit : suberect 55 ; prostrate 1 : subprostrate 3 ; spreading 59 ; no overwintering barren stems ; stems up to 7·1 dm.

Surface : all glabrous and mat.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : not scored.

Inflorescence : number of flowers 15 to 32.

Calyx : inflated 40 : subinflated 18 ; anthocyanin medium 18 : little 40.

Corolla : Dy 4 : My 22 : Py 4 : MY 28 ; no petals multilobed ; entire 43 : entire to emarginate 5 : emarginate 8 : 1/4-lobing 2 ; boss 8 : no boss 50 ; anthocyanin blotch in 13 MY plants ; petals and segments not overlapping ; acute petals 4 ; 12 petals tipped MY ; one plant with MY petals had these coloured at the tip.

Sex : hermaphrodite and female 3 : female 55.

Androecium : filaments purple 3 : anthers purple 3 ; non-polliniferous anthers 7 ; petaloid staminodes 21 ; two with My petals had petaloid staminodes speckled with colour ; 3 Dy, 8 My, and 1 Py had flush colour in the staminodes.

Gynoecium : stigmata purple 58 ; immature seeds white 52.

Capsules : *S. vulgaris* type 49 : verging towards intermediate type 6.

Mature seeds : armadillo 52.

Sterility : not marked with open pollination.

N. 294=N. 154 plant 27 x N. 121 plant 3. 52 plants in the family.

Habit : erect 3 : suberect 4 : subprostrate 9 ; spreading 7 : subspreading 42 : compact 3 ; no overwintering barren shoots ; stems up to 6·6 dm.

Surface : all glabrous and mat.

Leaves : HG 4 : GH 14 : H 25 : VH 6 : HV 1 : V 2.

Anthocyanin in vegetative parts : much 2 : medium 42 : little 8.

Inflorescence : number of flowers 12 to 65 (no definite mode).

Calyx : inflated 11 : subinflated 41 ; anthocyanin medium 52.

Corolla : Dy 17 : My 11 : MY 24 ; no petals multilobed ; entire 43 : emarginate 9 ; boss 1 : no boss 51 ; anthocyanin blotch present in 3 MY plants ; no overlapping of petals or segments ; acute petals 1.

Sex : female 52.

Androecium : petaloid staminodes 43 ; of these 8 Dy plants, 1 My plant had anthocyanin colour in the staminodes.

Gynoecium : stigmata purple 48 : white 4 ; immature seeds white 48.

Capsules : *S. vulgaris* type 48 : verging to intermediate 1.

Mature seeds : armadillo 49.

Sterility : not marked with open pollination.

N. 295=N. 154 plant 28 x N. 121 plant 3. 66 plants in the family.

Habit : erect 4 : suberect 61 : subprostrate 1 ; spreading 64 : subcompact 1 : compact 1 ; no overwintering barren shoots ; stems up to 6·0 dm.

Surface : all glabrous and mat.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : medium 66.

Inflorescence : number of flowers 18 to 49.

Calyx : inflated 24 : subinflated 42 ; anthocyanin medium 34 : little 32.

Corolla : Dy 17 : My 25 : Py 4 : MY 20; no petals multilobed ; entire 9 : entire to emarginate 14 : emarginate 18 : emarginate to 1/4-lobing 3 : 1/4-lobing 6 : 1/4 to 1/2-lobing 2 : 1/4 to 1/3-lobing 2 : 1/3 to 1/2-lobing 3 : 1/3 to 3/4-lobing 1 : 1/2-lobing 2 : 1/2 to 2/3-lobing 5 : 1/2 to 3/4-lobing 1 ; boss 19 : no boss 47 ; anthocyanin blotch present in 3 MY plants ; no overlapping of petals and segments ; no acute petals ; 14 petals tipped MY.

Sex : hermaphrodite and female 5 : female 61.

Androecium : filaments purple 5 ; anthers purple 5 ; non-polliniferous anthers 16 ; petaloid staminodes 36 ; of these 1 Dy and 3 My showed a flush of colour in the staminodes and 1 Dy and 2 My showed specks of colour in the staminodes.

Gynoecium : stigmata purple 65 : white 1 ; immature seeds white 63.

Capsules : *S. vulgaris* type 58 and 2 verging to intermediate.

Mature seeds : weak tubercled : 25 : armadillo 24 : weak armadillo 10.

Sterility : not marked with open pollination.

N. 155=*S. glareosa* emarginate variant K. 1099 plant 41 x *S. vulgaris* N. 12 plant 251. 46 plants in the family.

Habit : all spreading and subprostrate ; all died down and no overwintering barren shoots ; stems up to 7·5 dm.

Surface : all glabrous, all mat.

Leaves : intermediate.

Anthocyanin in vegetative parts : much 34 : medium 12.

Inflorescence : from 7 to 49 flowered.

Calyx : inflated 46 ; anthocyanin medium 46.

Corolla : Marguerite Yellow 46 ; no multilobed petals ; entire 10 : emarginate 16 : 1/4-lobing 4 : 1/3-lobing 4 : 1/2-lobing 1 : 1/2 to 3/4-lobing 1 : 2/3-lobing 5 ; 3/4-lobing 4 ; boss 25 : no boss 20 ; no anthocyanin blotch ; petals and segments not overlapping.

Sex : hermaphrodite 5 : hermaphrodite and female 2 : female 38.

Androecium : filaments purple 7 ; anthers purple 7 ; non-polliniferous anthers 7 ; petaloid staminodes 16.

Gynoecium : stigmata purple 41 : white 4 ; immature seeds white 46.

Capsules : intermediate 45.

Mature seeds : armadillo 38 : weak armadillo 7.

Sterility : not marked with open pollination.

N. 155 plant 30. Anthocyanin in vegetative parts medium, petals 1/2 to 3/4-lobing, boss, hermaphrodite, stigmata purple, seeds armadillo.

N. 155 plant 36. Anthocyanin in vegetative parts much, petals 2/3 to 3/4-lobing, boss, hermaphrodite, stigmata purple, seeds armadillo.

N. 155 plant 1. Anthocyanin in vegetative parts much, petals entire, no boss, female, petaloid staminodes, stigmata white, seeds armadillo.

N. 12 plant 251. *S. vulgaris* for habit and leaves, with little anthocyanin, few hairs, calyx inflated with some anthocyanin, hermaphrodite, boss, filaments, anthers and stigmata purple, immature seeds white, *S. vulgaris* type capsule, seeds armadillo.

With controlled pollination :

N. 155 plant	Total seeds	Capsules in which seeds counted	Average per capsule
30	178	6	29·66
36	456	11	41·45
1 x 30	220	3	73·33
1 x 36	1033	22	46·95

N. 290=N. 155 plant 30 selfed. 17 plants in the family.

Habit : suberect 10 : subprostrate 6 : prostrate 1 ; spreading 14 : subspreading 3 ; no overwintering barren shoots ; stems up to 6·7 dm.

Surface : all mat ; indumentum stems and leaves glabrous 17 ; inflorescence branches few 3 : very few 1 : glabrous 13.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : medium 7 : little 8.

Inflorescence : number of flowers 10 to 53.

Calyx : inflated 12 : subinflated 5 ; anthocyanin medium 13 : little 3.

Corolla : white 17 ; petals bilobed 17 ; emarginate 1 : emarginate to 1/3-lobing 1 ; 1/4-lobing 1 ; 1/4 to 1/3-lobing 2 : 1/2-lobing 1 : 1/2 to 2/3-lobing 1 : 1/2 to 3/4-lobing 2 : 2/3 to 3/4-lobing 4 : 3/4-lobing 4 ; boss 14 : no boss 3 ; anthocyanin blotch absent 17 : petals and segments not overlapping 17.

Sex : hermaphrodite 7 : female 10.

Androecium : filaments purple 6 ; anthers purple 6 ; non-polliniferous anthers 6 ; petaloid staminodes 1.

Gynoecium : stigmata purple 16 ; immature seeds white 14.

Capsules : *S. vulgaris* type 3 : intermediate 12.

Mature seeds : armadillo 15.

Sterility : not marked with open pollination. 23 out of 40 plants died in the winter 1939–40.

N. 310=N. 155 plant 36 selfed. 4 plants in the family.

Habit : suberect 4 ; spreading 2 : subspreading 2 ; no overwintering barren shoots ; stems up to 3·6 dm.

Surface : all mat and glabrous.

Leaves : all *S. vulgaris* type.

Anthocyanin in vegetative parts : medium 4.

Inflorescence : number of flowers 6 to 25.

Calyx : inflated 2 : subinflated 2 ; anthocyanin medium 4.

Corolla : MY 2 : W 2 ; bilobed 4 ; 1/2 to 2/3-lobing 2 : 2/3-lobing 1 : 2/3 to 3/4-lobing 1 ; boss 4 ; anthocyanin blotch absent 4 ; petals overlapping 1 : not overlapping 3 ; segments not overlapping 4.

Sex : hermaphrodite 1 : female 3.

Androecium : filaments purple 1 ; anthers purple 1 ; non-polliniferous anthers 3 ; no petaloid staminodes.

Gynoecium : stigmata purple 4 ; immature seeds white 3.

Capsules : intermediate type 2.

Mature seeds : armadillo 1.

Sterility : seed production poor. 11 plants died in the 1939–40 winter.

N. 298=N. 155 plant 1 x N. 155 plant 30. 30 plants in the family.

Habit : subprostrate 13 : prostrate 17 ; spreading 30 ; no overwintering barren shoots ; stems up to 7·7 dm.

Surface : all glabrous and mat.

Leaves : G 1 : HG 3 : GH 9 : H 14 : VH 3.

Anthocyanin in vegetative parts : much 10 : medium 20.

Inflorescence : number of flowers 8 to 70.

Calyx : inflated 19 : subinflated 11 ; anthocyanin medium 30.

Corolla : MY 27 : W 3 ; no petals multilobed ; entire 1 : emarginate 12 : 1/3-lobing 6 : 1/2-lobing 3 : 2/3-lobing 5 : 3/4-lobing 3 ; small scale 2 : boss 13 : no boss 15 ; anthocyanin blotch absent 30 ; petals overlapping 4 : not overlapping 25 ; segments not overlapping.

Sex : hermaphrodite 10 : hermaphrodite and female 1 : female 19.

Androecium : filaments purple 8 : white 2 ; anthers purple 10 ; non-polliniferous anthers 0 ; petaloid staminodes 8.

Gynoecium : stigmata purple 12 : white 18 ; immature seeds purple 2 : white 28.

Capsules : *S. maritima* type 2 : intermediate 22 : *S. vulgaris* type 5.

Mature seeds : armadillo 27 : weak armadillo 1.

Sterility : not marked with open pollination.

N. 309=N. 155 plant 1 x N. 155 plant 36. 2 plants in the family.

Habit : suberect 1 : subprostrate 1 ; spreading 2 ; no overwintering barren shoots ; stems up to 5·3 dm.

Surface : glabrous and mat.

Leaves : *S. vulgaris* type.

Anthocyanin in vegetative parts : much 2.

Inflorescence : number of flowers 27 and 30.

Calyx : inflated 1 : subinflated 1 ; anthocyanin medium 2.

Corolla : MY 2 ; no petals multilobed ; 1/3 to 2/3-lobing 1 : 1/2 to 2/3-lobing 1 ; boss 2 ; anthocyanin blotch absent ; petals and segments not overlapping.

Sex : female 2.

Androecium : non-polliniferous anthers 2.

Gynoecium : stigmata purple 2 ; immature seeds white 2.

Capsules : *S. maritima* type 1 : intermediate 1.

Mature seeds : armadillo 2.

Sterility : not marked with open pollination. 14 plants died in the 1939–40 winter.

Discussion and conclusions.

The crosses considered in this section involve a plant of *S. glareosa* with slightly emarginate petals and staminodes replacing stamens. In *S. maritima* and *S. vulgaris* petals are generally bilobed with the lamina 3/4 (more rarely 2/3) lobed. In both these species flowers functionally female (male sterile) are of fairly common occurrence. In such functionally female flowers the stamens are reduced to mere vestiges not, as in the *S. glareosa* plant referred to above, developed as more or less petaloid staminodes. The petals of the *S. glareosa* plant were Marguerite Yellow in colour. These characters (petal shape, petal colour, and the presence of petaloid staminodes) were new ones to our series of researches and it appeared possible that by breeding from this plant some additional information could be obtained regarding the genetics of petal lobing and sex in the bladder campions. Since the *S. glareosa* plant was functionally a complete female (male sterile) reciprocal crosses could not be made but nine different plants were used as pollen parents in the experiments outlined above. Six of these were used to pollinate *S, glareosa*, K. 1099 plant 41, directly. The results show clearly that the characters mentioned above have a genetic basis.

The genetic behaviour of characters, other than the special ones, followed, in general, results obtained in previously recorded breeding work and there is no need here to consider in detail habit, indumentum, leaf shape, anthocyanin occurrence and distribution (apart from petal colour), calyx and capsule shapes, and testa surface.

PETAL COLOUR.

(see p. 35 for key to symbols).

None of the plants used as pollen parents had Marguerite Yellow (MY) petals and no petals of this colour had appeared when they were used in selfings or crossings other than those recorded here. Marguerite Yellow colour and Marguerite Yellow background was introduced genetically from *S. glareosa* K. 1099 plant 41, the ovule parent in all the F_1 crossings. The following are summated results :

(1) F_1 families with four different *S. maritima* pollen parents with W petals :

N. 146 gave MY 15 : W 60
N. 147 ,, MY 23 : W 54
N. 148 ,, MY 11 : W 66
N. 149 ,, MY 22 : W 67

Totals 71 : 247=1 : 3·48.

(2) F_1 family with *S. vulgaris* Loch Tay with M coloured petals as pollen parent :

N. 154 gave MY 29 : coloured 35.

Of the coloured petals at least 14 had MY tips and all had MY background.

(3) F_1 family with *S. vulgaris* as pollen parent with W petals :

N. 155 gave MY 46 : W 0.

(4) F_2 families and others involving *S. maritima* :

(a) Selfings of F_1 plants with W petals :

N. 274 gave MY 0 : W 7
N. 275 ,, MY 5 : W 14
N. 276 ,, MY 1 : W 18
N. 268 ,, MY 1 : W 14
N. 269 ,, MY 16 : W 20
N. 278 ,, MY 1 : W 3

Totals 24 : 76 =1 : 3·17.

(b) Two F_1 plants with white petals crossed :

N. 300 gave MY 12 : W 17

(c) An F_1 plant with W petals crossed with *S. maritima* :
N. 271 gave MY 36 : W 31
N. 307 ,, MY 9 : W 7

(d) Selfings of F_1 plants with W petals :
N. 272 gave MY 21 : W 39
N. 273 ,, MY 5 : W 19
N. 282 ,, MY 12 : W 19
N. 283 ,, MY 8 : W 35
N. 320 ,, MY 6 : W 5

Totals 52 : 117=1 : 2·25.

(e) Selfings of F_1 plants with W petals :
N. 270 gave MY 2 : W 11
N. 321 ,, MY 0 : W 13

(f) An F_1 plant with MY petals crossed with *S. maritima* :
N. 281 gave MY 0 : W 48
N. 305 ,, MY 0 : W 10
N. 312 ,, MY 0 : W 28

(g) Two F_1 plants of different parentage crossed together :
N. 315 gave MY 5 : W 12

(h) An F_1 plant with W petals crossed with *S. maritima* :
N. 291 gave MY 0 : W 10
N. 303 ,, MY 0 : W 21

Families under (f), (g), and (h) all involved *S. maritima* N. 18 plant 11. Only one family (N. 315) out of six yielded any plants with MY petals.

(5) F_2 families and others involving *S. vulgaris* from Loch Tay with medium coloured petals :

N. 274 (selfing of F_1) gave 12 MY background.

N. 229 (two F_1 plants crossed together) gave 62 MY background: 2 W.

N. 301 (two F_1 plants crossed together) gave 67 MY background.

N. 304 (two F_1 plants crossed together) gave 50 MY background.

N. 293 (an F_1 plant crossed with another Loch Tay plant) gave 58 MY background.

N. 294 (as last) gave 52 MY background.

N. 295 (as last) gave 66 MY background.

These families (not all strictly comparable) gave a total of 369 MY background : 2 W.

(6) F_2 families involving *S. vulgaris* with white petals :
N. 290 (F_1 plant selfed) gave W 17.
N. 310 (F_1 plant selfed) gave MY 2 : W 2.

N. 298 (two F_1 plants crossed together) gave MY 27 : W 3.

N. 309 (two F_1 plants crossed together) gave MY 2.

LOBING OF PETALS.

Petal lobing in the plants here considered was difficult to score since there were often fluctuations on the same plant for different petals at the same or different dates. The results of our scoring are even more difficult to summarize. The following conclusions can be drawn :

1. While petal lobing is in some ways genetically controlled clear-cut segregation and ratios capable of simple Mendelian interpretation do not appear.

2. Every family (F_1, F_2, or backcross) shows segregation, the majority from entire or emarginate to 3/4-lobing.

3. While the entire or emarginate condition was introduced by *S. glareosa* K. 1099 plant 41, used as ovule parent, it is clear that the pollen parent is not without influence on the depth of lobing. Presumably, therefore, absence of or depth of lobing is not controlled by or only by maternal plasmagenes. There are striking differences in the ratios for individual F_1 and F_2 families which prove this. It is also evident by comparing the results of using *S. maritima* as pollen parent with those obtained when *S. vulgaris* was used. Thus, summating plants with entire and/or emarginate petals with those with petals showing 3/4-lobing we obtain the following figures :

	entire to emarginate	3/4-lobing
S. maritima as pollen parent (F_1 families) ...	85	64
S. vulgaris (Loch Tay) as pollen parent (F_1 families)	54	0
S. vulgaris as pollen parent (F_1 families) ...	26	4
S. maritima as pollen grandparent (F_2 families)	143	127
S. vulgaris (Loch Tay) as pollen grandparent (F_2 families)	286	16
S. vulgaris as pollen grandparent (F_2 families)	15	14

4. The evidence from fluctuations may be interpreted as due to only partial control by chromosomal genes.

SEX.

By hermaphrodite (H) is here meant that all flowers examined had functional ovules and functional pollen ; by female (F) is meant that all flowers examined had functional ovules but no functional pollen, whatever the state of development of the stamens (or staminodes) ; by hermaphrodite and female (HF) is meant that on the one plant there were hermaphrodite and female flowers as defined above.

Difficult as the results are to interpret in detail it is evident that the sex condition is in part at least genetically controlled. The very different ratios obtained when different pollen parents are used with the same ovule parent indicate this. F_1 families, all with K. 1099 plant 41 as the ovule parent but every one with a different pollen parent, gave the following results :

N. 146 H 11 : HF 3 : F 61
N. 147 H 16 : HF 1 : F 60
N. 148 H 43 : HF 0 : F 34
N. 149 H 31 : HF 11 : F 47
N. 154 H 1 : HF 3 : F 59
N. 155 H 5 : HF 2 : F 38

Striking differences also occur in F_2 families and backcrosses. Summations of F_2 families and backcrosses from the above F_1 families give the following figures :

From N. 146 H 17 : HF 2 : F 26
,, N. 147 H 21 : HF 41 : F 105
,, N 148 H 52 : HF 7 : F 101
,, N. 149 H 3 : HF 3 : F 154
,, N. 154 H 26 : HF 33 : F 311
,, N. 155 H 18 : HF 1 : F 34

Very marked are the differences in the ratios of F_2 families from N. 149 from those from N. 146, 147, and 148, although all four had *S. maritima* grandparents but belonging to different stocks.

It should be noted that plants were scored for sex generally at maximum anthesis in one season only. This meant that only flowers then in bloom were examined. It is possible that some plants scored as H or F would be scored HF if it had been possible to score every flower over several seasons.

We have found no male plants (gynoecium deficient or non-functional) in either wild populations or bred families. Similarly we have found no morphological neuters. On the other hand, the androecium abnormalities which result in the female as distinct from the hermaphrodite condition are of at least three kinds. First, vestigial stamens, very few mm. in length, around the base of the ovary. This is the common kind and is found widely in *S. maritima* and *S. vulgaris*. Secondly, " non-polliniferous stamens ", in which the filaments are normally developed but the anthers contain no viable pollen. Thirdly, with petaloid (or more or less petaloid) staminodes. This last is the rarest condition in our experience. All three kinds of abnormal androecium may show fluctuations in one and the same plant or in one and the same flower. There are, however, individual plants which were " fixed females " in that one or other of the three states of abnormal androecium appeared in every one of the 10 organs occupying the position of stamens, in every flower of the plant, throughout a season, and for all seasons during which the plant was under observation. For example, this was true for K. 1099 plant 41.

In the F_1 and F_2 families involving *S. glareosa* K. 1099 plant 41 all the three types of abnormalities mentioned above, as well as intergrades, appeared. It is, therefore, probable that they are genetically related one to another. There is also some connection between petal morphology and the degree and kind of stamen or staminode development. Thus, hermaphrodite flowers have larger petals than female ones that are genetically otherwise similar. This is sometimes well seen in plants with both hermaphrodite and female flowers. On the whole, as in K. 1099 plant 41, in the series of families dealt with above flowers with petaloid staminodes have emarginate (or entire), or at least not deeply bilobed, petals that are Marguerite Yellow in colour. These facts suggest that some at least of the special gene complexes acting on the development of the androecium also act on the development of the corolla. This may be genetical evidence in favour of those theories deriving petals from stamens in some families at least.

The not infrequent occurrence of HF plants and the occurrence of flowers with 1 to 9 stamens producing viable pollen can only be explained by some kind of somatic differentiation, whether this be somatic segregation in any Mendelian sense or the result of cytoplasmic factors unequally distributed, or both. The cytoplasmic factors, if such there be, may be environmental in nature or action rather than plasmagenes acting directly on organ primordia. They may also be dependent for their action on a certain stage of ontogenetic development of the plant, of an inflorescence, or even of a flower. To this extent there may be a time control.

The suggestion therefore, is made that a basic gene set, chromosomal in location and thus under control in a normal Mendelian manner, is primarily responsible for production of the sex organs. Such a set may be of the MMFF type. Superimposed on the potentialities of this basic set genes acting as retarders of stamen development and (rarely) others which modify stamens to petaloid staminodes may be present. Some, if not all, the retarding and modifying genes are probably located in the cytoplasm.

SUMMARY.

1. In this paper are described the results of genetical studies on material of *Silene glareosa* and *S. alpina* from the French Alps. Stock plants and the results of selfings and intrataxic crossings are described. Crosses were also made between both of these taxa and British *S. maritima* and *S. vulgaris* and Norwegian *S. vulgaris*.

2. *Habit. S. glareosa* and *S. alpina* were both hemicryptophytic. Genes for the chamaephytic habit were introduced by crossing each of these with *S. maritima*. Expression and segregation of this character pair was not clear-cut, partly because a number of genes of small single effect are probably involved and partly because of an overlap in the influence of genetic and environmental factors. All *S. glareosa* plants used as stock plants were glabrous. A short bristly type of indumentum occurred in most *S. alpina* plants used in breeding. This had a genetic basis and there was segregation in families when such plants were used as either male or female parents. Usually the segregation involved both presence and absence of hairs and, if they were present, their density of development. Glabrous *S. alpina* bred true to the glabrous character when crossed with *S. glareosa* reciprocally. Shining green surface is recessive to mat. Genes for this character were introduced in some crosses by using a plant (N. 12/219) which was heterozygous for mat and shining green surface. The recessive character appeared in a small number of F_2 individuals.

3. *Leaves.* Leaf shape is controlled genetically by a large number of genes. Very often F_1 plants are intermediate in shape or show a tendency

for narrowness to be more or less dominant. Segregation generally occurs in F_2.

4. *Inflorescence.* *S. maritima*, *S. glareosa*, and *S. alpina* have very few (1 to 7) flowered inflorescences. *S. vulgaris* has typically many (frequently 30 to 70) flowered inflorescences. F_1 between *S. vulgaris* and one of the other taxa mentioned is more or less intermediate and there is a range of segregation in F_2.

5. *Calyx.* Inflated, subinflated, narrow, and long cylindric calyces characterized various stock plants used for selfings and crosses. Segregations occurred in many F_1 and F_2 families for these shapes and for combinations of shapes. Some of the combinations gave new characters (e.g. in N. 269 and N. 278).

6. *Corolla.* In British *S. vulgaris* and *S. maritima* the petals at anthesis are most often white but purplish coloured variants have been investigated genetically (see K.B. 1940, 66 ; K.B. 1948, 264). Colour in the petals is much commoner in *S. alpina* and *S. glareosa.* A colour, Marguerite Yellow, new in petals at anthesis to the taxa with which we have worked, is described and sometimes occurred in combinations with the Laelia Pink series of colours of Loch Tay plants from which series it is genetically quite distinct. There was segregation between White and Marguerite Yellow except when the White flowered parent lacked anthocyanin in all parts except the immature seeds (N. 18 plant 11). In young buds of normally white flowered *S. maritima* and *S. vulgaris* the abaxial surface of the immature petals are Marguerite Yellow. Further, Marguerite Yellow is present, as a rule, in the petals at anthesis of female flowers not of hermaphrodite flowers, in offspring originating from the emarginate variant. These and other facts suggest that gene action here involves delay in development of petals and androecium relative to calyx and gynoecium.

The anthocyanin colour series showed segregation for presence and absence. How far intensity of colour, when present, is controlled genetically and how far environmentally and ontogenetically is uncertain.

One " poor petal " plant segregated in N. 275. Genes for this character were introduced by the grandparent S.P.A. 13.

Coronal development is very meagre in *S. glareosa* and *S. alpina* compared with typical *S. maritima.* In some plants of offspring families there was no detectable corona at all. The series from scale to boss and thence to total absence of corona is a continuous one and the scoring classes are arbitrary. There was, however, undoubted segregation in F_2, and some times in F_1, families.

Lobing of petals was studied in detail in the series of families involving the emarginate variant of *S. glareosa.* There were many fluctuations but the results prove an underlying genetic control with segregation of genes some, at least, of which were chromosal.

In spite of the reduction of flower number per inflorescence, flowers of of *S. glareosa* and *S. alpina* are zygomorphic. In the latter the flowers are usually not quite so strongly zygomorphic as the flowers of *S. vulgaris* but they are not erect and actinomorphic as in *S. maritima.*

Undoubtedly the best development of petals in the bladder campions we have used occurs in many stocks of *S. maritima.* In stocks of this taxon we have often : large deeply lobed petals, overlapping of petals and segments, multilobing, full coronal scales, and anthocyanin blotch. There is in the *S. glareosa* emarginate variant, and in plants derived from this, a general retardation of development in some or all of these characters

7. *Sex.* Tabulations of results obtained are given at the end of sections. In particular it is to be noted that very different ratios result when different pollen parents are used to pollinate the same plant as ovule parent. One other example of this may be given :

K. 1094/20	x K. 1099/8	gave	F 14
,,	x K. 1094/20	,,	F 10
,,	x K. 1095/14	,,	H 25
,,	x K. 1085/57	,,	F 2
,,	x S.P.A. 70	,,	F 66
,,	x N. 12/219	,,	H 13 : F 21
,,	x P. 1/11	,,	HF 1 : F 20

The facts given in this and other papers of the series prove that there are genes with sometimes partial, sometimes complete, control of " sex " expression. The potency of such genes may not always be the same and in addition to them there are probably modifying factors.

8. *Mature seeds.* Full armadillo was recessive to normal tubercled but in some families dealt with in this paper there were modifying factors present for testa characters, sometimes with unexpected consequences. In some capsules, for example, there was somatic segregation resulting in different types of seeds present in the same capsule (e.g. N. 176). Seed characters in the high mountain bladder campions were sometimes less clear-cut than in many British populations of *S. maritima* and *S. vulgaris* and the obscuring of class boundaries was still more marked in crosses between stocks of widely different geographical origin.

9. *Capsules. S. alpina* and *S. glareosa* have *S. maritima* type capsules which type was also common in high mountain *S. vulgaris.* The capsule characters are most often well differentiated in British populations of *S. maritima* and *S. vulgaris*, with F_1 intermediate. The *S. maritima* type of capsule was retained in crosses between *S. glareosa* or *S. alpina* and *S. maritima* but with *S. vulgaris* there was segregation for capsule shape.

10. *Sterility.* In the series of selfings and crosses recorded here, sterility is expressed either in failure to set seeds after pollination or in failure of apparently "good" seeds to germinate. A greater degree of sterility has been encountered in the pollinations here recorded than elsewhere in our work.

In *S. glareosa* and *S. alpina* there was a good deal of self-sterility in the sense that generally only small families were raised on selfing. On crossing *S. glareosa* and *S. alpina* together there was much sterility which was complete in F_2.

In *S. glareosa* x *S. maritima* sterility varied ; with some individual parents it was marked in F_2 not in F_1 ; with others it was inconsiderable ; in others, medium to large families were obtained only by pollinating large numbers of flowers.

In *S. alpina* x *S. maritima* sterility also varied. In F_1 it was not marked but occurred strongly in F_2 but rather less than the averages for F_2 in *S. glareosa* x *S. maritima*.

In *S. glareosa* x *S. vulgaris* sterility was generally not marked in F_1 but was more or less present in F_2 and very marked in F_2.

In *S. alpina* x *S. vulgaris* sterility was generally not marked in F_1 but was strongly present in F_3.

Crosses between sibs and back crosses sometimes partially renewed fertility.

One can sum up by saying that sterility was generally present when crosses between taxa were made, that its degree varied greatly, that it was most frequently incomplete (some viable seeds being set), and that it was usually more marked in F_2 than in F_1.

The research on which this paper is based has been aided by a Royal Society Government Grant.

RESEARCHES ON SILENE MARITIMA AND S. VULGARIS :— XXXIII.

E. M. MARSDEN-JONES AND W. B. TURRILL.

STUDIES OF SEEDLINGS.

Seedlings representative of a large number of the families (selfings and crossings) that have been considered in this series were preserved for later comparative studies. For obvious reasons only very small numbers of seedlings could be abstracted from most families and no attempt was made to obtain ratios genetically significant. It should be noted that we have scored for lamina shape of cotyledons and that measurements are given in mm. for total length of a cotyledon including lamina and petiole. The cotyledon shapes are always closely correlated with the shape of the first two to three pairs of young foliage leaves, except that the apices are less acute and more obtuse or rounded. In the bladder campions the cotyledons have axillary buds which often very quickly grow out into well-formed elongating lateral branches.

There are two main shape types of cotyledons in the families dealt with here. These we call I and II and define them as follows :

I, blade oblong gradually narrowed into the petiole.

II, blade ovate-oblong to elliptic generally abruptly narrowed into the petiole.

S. MARITIMA.

A. 7 x A. 12 (N. 21) : I, 14 x 4.

A. 20 x A. 12 (N. 19) A. 20 x A. 7 (N. 22), and A. 2 x A. 13 (N. 68) : are all I and showed no segregation.

A. 22 selfed (N. 55) : I, 18 x 6 ; selfings of N. 55 gave I, 20 x 6·5 and showed no obvious segregation.

A. 2 x A. 13 (N. 36) ; selfings of N. 36 (13 seedlings) : I, 18 x 5·5, no segregation.

A. 15 x A. 12 (N. 33) ; selfings of N. 33 (17 seedlings) : I, no segregation.

A. 70 selfed (N. 104) : (10 seedlings) narrow I, 22 x 5 ; selfings of N. 104 (9 seedlings) narrow I.

A. 5 selfed (N. 14) : narrow I, 24 x 3·5 ; A. 13 selfed (N. 16) : I, 18 x 4·5 ; A. 5 x A. 13 (N. 34) : I, 23 x 5·5 ; selfings of N. 34 gave narrow I, 22 x 4 and I, 23 x 4.

A. 15 selfed (N. 38) : narrow I, 14 x 2·5.

A. 1 selfed (N. 8) : I, 19 x 5.

A. 21 selfed (N. 46) : (12 seedlings) some segregation from I, 19 x 4·5 to II, 21 x 6·5.

A. 2 x A. 21 (N. 47) : (3 seedlings) I–II, 25 x 7 ; selfings of N. 47 (5 seedlings) showed segregation from I, 27·5 x 6 to II, 18·5 x 6.

P. 4 (Sweden) : (2 seedlings) I (slightly verging to I–II), 21 x 5 ; selfings of and crossings between P. 4 plants (40 seedlings) showed segregation from I, 19 x 4·5 to II, 22 x 7.

S. VULGARIS.

B. 5 selfed (N. 12) : (7 seedlings) I–II, 18·5 x 7 ; selfings of N. 12 (4 seedlings) gave I–II, 23·5 x 6·5.

B. 16 x B. 11 (N. 37) : II, 22 x 7·5 ; N. 37 selfed, II, no segregation.

B. 1 selfed (N. 9) : II, 17 x 5·5.

B. 38 selfed (N. 122), B. 39 selfed (N. 120), and selfings from N. 120, all II, 24 x 7 ; B. 37 selfed (N. 121) and N. 121 selfed gave I–II, 23 x 5·5.

P. 1 (Norway) : (2 seedlings) II, 24 x 7 ; selfing of P. 1 plant 11 (4 seedlings), II.

P. 2 (Switzerland) : II, 21 x 9 ; selfings of four P. 2 plants (10 seedlings) ranged from I–II to II.

P. 3 (Switzerland) : selfings of four P. 3 plants ranged from I–II to II.

N. 12 (B. 5 selfed) plant 219 x P. 1 (N. 216) (3 seedlings) II, 27 x 8 ; selfings of N. 216 plants (43 seedlings) gave a range from I, 17 x 3·5 to II, 17·5 x 6·5.

N. 12 plant 251 x B. 39 (N. 125) : (4 seedlings) II, 21 x 7·5 ; selfings of N. 125 plants : (12 seedlings) II.

P. 5, P. 6, P. 7, P. 8 (Pyrenees) : extreme II, 19 x 9·5 mm. Selfings to second generation (42 seedlings) gave only II or extreme II, 18 x 4·5 and 18 x 9·5.

B. 35 selfed (N. 23), B. 36 selfed (N. 56), and N. 56 selfed : extreme II, 13 x 8·5 and 20 x 10.

B. 5 x B. 39 (N. 125) : (4 seedlings) II, 21 x 7·5 ; N. 125 selfings (12 seedlings) II.

S. MARITIMA x S. VULGARIS (and reciprocal).

A. 15 x B. 11 (N. 40) : I–II, 22·5 x 8 ; N. 40 selfings : segregation into I, II, and I–II, ranges from 24 x 5·5 to 23·5 x 8, with intermediates averaging 23 x 6.

A. 2 x B. 11 (N. 42) : I–II (but broader than in N. 40), 25 x 8 ; N. 42 selfing (2 seedlings) I–II, 26 x 7·5.

B. 11 x A. 5 (N. 52) ; N. 52 selfings (6 seedlings) gave segregations : I, 26 x 4 (2 seedlings) and I–II, 28 x 6 (4 seedlings).

A. 1 x B. 1 (N. 4) ; N. 4 selfing (16 seedlings) : segregation with extremes I, 22·6 x 7 and II, 18·5 x 8·5.

B. 11 x A. 21 (N. 49) : I–II, 27 x 7·5 ; N. 49 selfings (5 seedlings) : I–II, 25 x 7.

A. 70 x N. 12 plants (N. 110, N. 111, N. 116) : (13 seedlings) I–II ; selfings of N. 110, N. 111, and N. 116 (31 seedlings) showed segregation from narrow I, 24 x 4·5 (as in A. 70) to II, 24 x 7.

N. 36 plant 8 x B. 37 (N. 123) : (8 seedlings) I–II, 26 x 7 ; selfings of No. 123 plants (16 seedlings) : segregation from I, 20 x 5 to II, 21 x 6.

A. 70 x B. 37 (N. 126) : (6 seedlings) I, 26 x 6·5 ; N. 126 selfings : (17 seedlings) I–II, 18·5 x 6.

A. 6 x B. 36 (N. 25) : I–II, 26·5 x 9 ; selfings of N. 25 gave segregation from I, 29 x 6 to II, 20 x 8.5.

S. GLAREOSA.

Selfings of stock plants and crossings together of two stock plants from French Alps : (18 seedlings) range from I, 17·5 x 3 to II, 18·5 x 6.

P. 9 (Tyrol) selfed (N. 206) : I, 11 x 3.

K. 1094 plant 11 x P. 9 (N. 201) : (1 seedling) I, 17 x 3.

S. ALPINA.

Selfings of stock plants and crossings together of two stock plants from French Alps (7 seedlings) : II, 16 x 6.

S. GLAREOSA x S. MARITIMA.

K. 1099 plant 32 x A. 20 (N. 163) : 3 seedlings) I, 21 x 4·5 ; selfing of N. 163 (1 seedling) I.

K. 1099 plant 32 x A. 68 (N. 167) : (3 seedlings) I–II (verging to I), 23 x 6 ; selfings of N. 167 : (6 seedlings) gave segregation I, 21 x 5 (2 seedlings), I–II, 22 x 6 (3 seedlings), II, 17 x 6 (1 seedling).

K. 1094 plant 20 x A. 70 (N. 210) : (5 seedlings) I–II (verging to II), 17 x 6.

K. 1099 plant 32 x A. 70 (N. 182) : (3 seedlings) I–II ; selfings of N. 182 : (7 seedlings) I–II, 25 x 6.

S. GLAREOSA x S. VULGARIS.

In 10 F_1 and F_2 families (41 seedlings) all II, 20 x 6·5. In one F_2 family (N. 367) (1 seedling) I, 20 x 3.

K. 1094 plant 20 x P. 1 plant 11 (Norway) (N. 215) : (2 seedlings) II, 17 x 8.

K. 1099 plant 46 x P. 1 plant 11 (Norway) (N. 218) : (2 seedlings) I–II, 24 x 6 ; selfings of N. 218 : (34 seedlings), range from I to I–II, 19 x 4·5 to 18 x 6.

N. 12 plant 219 x P. 9 (Tyrol) (N. 200) : (3 seedlings) II, 23 x 6.

S. ALPINA AND S. MARITIMA.

K. 1085 plant 5 x A. 20 (N. 162) : (4 seedlings) I–II, 19 x 6 ; N. 162 selfed (N. 323) (1 seedling) I–II, 22·5 x 6·5 ; N. 162 selfed (N. 332) (1 seedling) I, 20 x 3·5.

K. 1085 plant 24 x A. 68 (N. 168) : (3 seedlings) I–II, 23 x 6·5 ; selfings of N. 168 : (7 seedlings) segregation into I, 22 x 4 and I–II, 21 x 6.

K. 1085 plant 13 x A. 70 (N. 176) : (8 seedlings) segregation into I–II, 14 x 3 (1 seedling) and II, 20 x 7 (7 seedlings) : selfing of N. 176 : (2 seedlings) segregation into I, 20 x 4·5 and II, 22 x 7.

S. ALPINA x S. VULGARIS.

Three F_1 families : (8 seedlings) I–II, 22 x 6·5 ; five F_2 families (12 seedlings) ranged from I, 13·5 x 3 to II, 17 x 5·5.

S. GLAREOSA x S. ALPINA.

K. 1094 plant 11 x K. 1091 plant 4 (N. 173) : (1 seedling) I, 5·5 x 1·5 ; selfing of N. 173 : (1 seedling) I–II, 14·5 x 4·5.

K. 1094 plant 20 x K. 1085 plant 57 (N. 213) : (1 seedling) II, 15·5 x 6·5.

K. 1085 plant 57 x K. 1099 plant 32 (N. 203) : (2 seedlings) I, 16 x 3·5 and I–II, 15 x 5.

K. 1085 plant 5 x P. 9 (Tyrol) : (1 seedling) II, 17 x 5.

CROSSES INVOLVING S. GLAREOSA EMARGINATE VARIANT.

K. 1099 plant 41 x A. 13 (*maritima*) (N. 146) : (3 seedlings) II, 15 x 6 ; selfings of N. 146 : (12 seedlings) segregation, I, 22 x 3·5 (3 seedlings), I–II, 21 x 6 (6 seedlings), II, 19 x 7 (3 seedlings).

K. 1099 plant 41 x A. 70 (*maritima*) (N. 147) : (3 seedlings) II, 17 x 5·5 ; selfings of N. 147 : (10 seedlings) segregation, I, 25 x 5 (2 seedlings), I–II, 22 x 6 (7 seedlings), II, 23 x 7 (1 seedling).

N. 147 plant 6 x N. 147 plant 7 (N. 300) : (3 seedlings) I–II, 21 x 7·5.

N. 147 plant 6 x N. 104 plant 10 and plant 11 (*maritima*) : (12 seedlings) I, 22 x 4·5 (2 seedlings), I–II, 22 x 5·5 (7 seedlings), II, 21 x 6·5 (3 seedlings).

K. 1099 plant 41 x A. 15 (narrow *maritima*) (N. 148) : (4 seedlings) I–II, 18 x 6 ; selfings of N. 148 : (32 seedlings) segregation I, 33 x 6·5 (3 seedlings), I–II, 29 x 7 (27 seedlings), II, 23 x 7·5 (2 seedlings).

K. 1099 plant 41 x N. 18 plant 11 (*maritima*) (N. 149) : (3 seedlings) II, 18·5 x 6·5 ; selfing of N. 149 : (3 seedlings) segregation I, 16 x 4 (1 seedling) and I–II, 24 x 6·5 (2 seedlings).

N. 149 x N. 18 plant 11 (and selfing of this) : (16 seedlings) segregation, I, 24·5 x 5 (5 seedlings), I–II, 19 x 5·5 (8 seedlings), II, 18 x 6 (3 seedlings).

K. 1099 plant 41 x B. 37 (N. 154) : (3 seedlings) II, 20 x 7·5 ; selfings of N. 154 : (7 seedlings) segregation I, 22·5 x 3 (2 seedlings), I–II, 31 x 8 (2 seedlings), II, 25·5 x 9 (3 seedlings).

N. 154 plant 49 x N. 154 plant 25 and N. 154 plant 28 x N. 154 plant 25: (5 seedlings) segregation I–II, 25 x 6 (3 seedlings), II, 21 x 7 (2 seedlings).

N. 154 plants x N. 121 plant 3 (Loch Tay) : (15 seedlings) I–II, 24·5 x 6·5.

K. 1099 plant 4 x N. 12 plant 251 (*vulgaris*) (N. 155) : (3 seedlings) II, 19 x 6·5 ; selfing of N. 155 : (3 seedlings) segregation I–II, 20 x 6 (1 seedling), II, 18·5 x 7 (2 seedlings).

N. 155 plant 1 x N. 155 plant 30 and N. 155 plant 36 : (8 seedlings) II, 22 x 8.

CROSSES INVOLVING AN AUSTRIAN MOUNTAIN PLANT (C. 1).

N. 44 (C. 1 selfed) : (2 seedlings) I, 13 x 3.

A. 2 (*maritima*) x C. 1 (N. 41) : F_1 (10 seedlings) and F_2 (5 seedlings) : I–II, 22 x 6·5.

A. 15 (narrow *maritima*) x C. 1 (N. 45) : F_1 (4 seedlings) and F_2 (6 seedlings) : I, 31 x 4·5.

C. 1 x A. 21 (Welsh mountain *maritima*) (N. 51) : (2 seedlings) I, 22 x 6·5 ; N. 51 selfed ; narrow I, 24·5 x 4·5.

C. 1 x B. 11 (*vulgaris*) : I, 25·5 x 8.

DISCUSSION AND SUMMARY.

Two main cotyledon shapes are distinguishable. One is exemplified by N. 104, N. 18, and N. 14 and the other by N. 10, N. 99 and N. 204 (see plates). Generally speaking the narrower type with more gradual constriction below is characteristic of *Silene maritima* and of some stocks of *S. glareosa.* The broader type with abrupt constriction below is characteristic of *S. vulgaris* and *S. alpina.* Hybrids often shown an intermediate condition as exemplified in N. 88 right-hand seedling and N. 226 left hand seedling (see plate). Apart rom shape the width and surface area of cotyledons are frequently closely correlated with the corresponding characters as seen in the foliage leaves. Thus, the narrow-leaved *S. maritima* (N. 14), from the Portland end of Chesil Beach, has very narrow cotyledons while the broad-leaved *S. vulgaris* (N. 204) from the Pyrenees, has very broad cotyledons.

In some selfings, F_1 families, and F_2 families there is obvious segregation for cotyledon shape. Segregation on selfing is shown, for example, by N. 46 and in F_2 families by N. 88 and N. 226.

The research on which this paper is based has been aided by a Royal Society Government Grant.

Flowers of the Seasons.*—Each of these four little booklets of forty pages deals with flowers of one of the seasons giving descriptions in popular language under the names of the months in which they bloom. Brief notes on their introduction and culture are provided together with the derivation of the names accompanied by the author's line drawings (partially coloured) of the flowers themselves. Clear, simple and nicely produced, the author has not written a scientific treatise but has succeeded in producing four interesting little booklets which will appeal to flower lovers both young and old.

• H.S.M.

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*1. Flowers that Bloom in Summer. 2. Flowers that Bloom in Autumn. 3. Flowers that Bloom in Winter. 4. Flowers that Bloom in Spring. By Audrey Wynne Hatfield. (Seasonal Flower Books) London : Castle Press. 1949. Price 2/6 each.

Botany for Gardeners.*—In these days of advanced research when great strides have been made in the application of modern science to the improvement and extension of our " garden wealth ", this is a valuable publication. It brings to both the amateur and professional gardener an accumulation of facts and research work drawn from over three hundred books, many of which have been available to but relatively few specialists. The author R. P. Faulkner, who has himself had long experience of practical gardening, explains the correlation of pure science with the practice of horticulture and traces the history of the plant through all its ups and downs of life ; he uses technical scientific terms only where essential, and throughout describes the subject in a simple and clear manner. There is an adequate index and the text is illustrated with 53 black and white line drawings, diagrams and tables, and with eight photographic plates.

The book covers a wide range of work but emphasises plant physiology and its practical application. This is of greatest interest to the gardener as it shows the reasons for many of the necessities of good cultivation. The important part water plays in the life of the plant is fully explained, from its absorption by the roots to its loss through the stomata on the leaf. The mineral salts taken in with the water are required to build up a healthy plant, and as the formation of different parts of the cell depend on different elements, a continuous well balanced supply for selection by the plant must be available. The soil-less cultivation of plants is useful for certain crops subject to root or soil borne diseases, but otherwise appears to have little future.

An account of the structure of the plant deals first of all with the composition of the living cell, and then with the differentiation of tissue into roots, stems and leaves, many of which become specialised for a definite function. The increase of tissue goes on continuously in the living plant and internal as well as external modifications have to be made to accommodate this. Plant hormones are now known to play an important part in the initiations, rates and directions of growth and study of these has shown that similar synthetic substances can be used to induce or control growth. There is a chapter dealing with photoperiodism, an important factor in this country where there is such a difference between the length of day in summer and winter. Amongst other things it effects times of flowering, formation of storage organs and dormancy in plants.

Reproduction may be by vegetative propagation or by sexual multiplication, but both methods have their advantages and limitations. One of the latter is sexual sterility which may be due to incompatibility of the pollen, abortion or the sexual organs, or as in the case of hybrids, the inability of the chromosomes to pair at meiosis due to genetical dissimilarity. An understanding of the elementary factors of evolution and inheritance, genetics and cytology will help to explain how many of our largest and finest flowers, fruits, and vegetables have come into being. Mutations, hybridization and natural and man-made selection have been the origin of many new species and varieties.

This clearly compiled book should well be able to provide a general background of scientific knowledge sufficient for the amateur, or a foundation for the more detailed studies of the specialist.

P. Lewis.

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*R. P. Faulkner, Botany for Gardeners. Frederick Muller Ltd. London, 1949, 12/6.

THE VALIDITY AND IDENTITY OF CHENOPODIUM GRAVEOLENS LAG. ET RODR..

J. P. M. Brenan.

Chenopodium graveolens was published by Lagasca and Rodriguez in Anales de Ciencias Naturales **5,** 70 (1802). The description formed part of a paper by the two authors entitled " Descripciones de algunas plantas nuevas que han florecido en el Real establecimiento botánico en el año 1801 ". *C. graveolens* Lag. et Rodr. raises two main questions which we are going to consider : firstly, whether the name is valid or not, and secondly, what Lagasca and Rodriguez' plant was, according to present-day taxonomy.

So far as I know, the legitimacy of *C. graveolens* Lag. et Rodr. was not questioned until Dr. P. Aellen, in a footnote on p. 105 of his paper entitled " Was ist das *Chenopodium graveolens* Willd. ? " published in Verhandl. Naturf. Gesellsch. Basel **41,** 105–8 (1930), wrote " da aber LAGASCA und RODRIGUEZ die binäre Nomenklatur in ihrem Artikel nicht anwenden, haben wir keinen Anlass, die Publikation im Sinne der " Nomenklatur-Regeln " anzuerkennen, um so weniger als die Autoren das " *graveolens* " in keiner Weise durch Typenverschiedenheit im Druck von den übrigen Wortern der Beschreibung hervorheben lassen ". The name was actually first mentioned in the following way :—

" CHENOPODIUM graveolens foliis ovatis, oblongisque, sinuatis ; pedunculis dichotomis, axilaribus ".

It will be noted that the first two words are the generic name and an epithet agreeing with the generic name, the case then changing to the ablative. This way of setting out applies to all the species described by Lagasca and Rodriguez in their paper referred to. Where the authors refer to their species in the text they do so by a binomial consisting of the generic name and the first following word. Lagasca and Rodriguez' paper is not the sole instance of the use of this method about this time. Let us take some papers by Cavanilles (surely a user of binomial nomenclature !) in Anal. Hist. Nat. **1,** 89–107 (1799), where a precisely similar method is followed ; some of the plants are illustrated, and the captions to the plates use binomials separable from the diagnosis in the way mentioned above ; further, binomials made by other authors, e.g. *Goodenia ovata* Sm. (l.c., p. 94), *Goodenia laevigata* Curt. (l.c., p. 97), are made to precede their diagnoses in the same way, unseparated by punctuation or by difference of typography. At this time it was a frequent practice for the diagnosis to follow on after the binomial on the same line, but normally separated by punctuation or type. Lagasca and Rodriguez seem to have thought that they could dispense with these aids to the reader. While their method is obviously silly and most misleading, the circumstantial evidence is, I think, conclusive that they employed and intended to employ orthodox binomial nomenclature. It therefore follows from this that *Chenopodium graveolens* Lag. et Rodr. must be considered as a legitimate and validly published name.

The identity of *C. graveolens* Lag. et Rodr. must now be dealt with. As early as 1814 *C. graveolens* was made, at least in part, a synonym of *C.*

foetidum Schrad. (cf. C. F. P. Martius, Pl. Hort. Acad. Erlang. Enum. 74 : 1814), and this line seems to have been followed, with or without doubt, by standard works ever since, e.g. by Moquin in the Prodromus, by the Index Kewensis, and by Baker and Wright in the Flora of Tropical Africa. The fact was not faced that if this were so *C. graveolens* Lag. et Rodr., being earlier than *C. foetidum* Schrad., would be the correct name for this widespread African species.

In order to see whether the traditional synonymy was correct, a request for the loan of the type-specimen of *C. graveolens* Lag. et Rodr. was made to Madrid. It seems that none of the original plant actually described was kept. However, by the kindness and courtesy of the Director of the Jardín Botánico at Madrid, a specimen from Lagasca's own herbarium was sent, on whose label was written : " Chenopodium Nepaulense H. Berol. C. graveolens H. Matr. Floruit Octobri anni 1822 ". From the date on the label this of course cannot be the type-specimen, but I see no reason to doubt that this is authentic *C. graveolens* Lag. et Rodr., and indeed it is probably a lineal descendant of the original plant, since we know that *C. graveolens* Lag. et Rodr. was in cultivation over a period of years at this time both at Madrid and other botanical gardens of Europe. The specimen agrees satisfactorily with Lagasca and Rodriguez' original description, and for its time is a good one. There is no doubt whatever that it is *Chenopodium botrys* L.

C. botrys has been repeatedly recorded from tropical Africa, but I have seen no specimen from there and know of no satisfactory evidence for its occurrence. Plants so named usually prove to be *C. schraderianum* Schult. (*C. foetidum* Schrad. (1808), non Lam. (1778)) or *C. procerum* Hochst. ex Moq. *C. botrys* differs from *C. schraderianum* in the absence of a keel to the tepals and in the more highly polished seeds, not shagreened as in those of *C. schraderianum*, which under the compound microscope show a different sculpturing of the testa. And there are normally subtler and less easily definable differences in habit and leaf-cutting. In all these points Lagasca's specimen squares with *C. botrys*.

This specimen is, however, not the only evidence bearing on the identity of *C. graveolens* Lag. et Rodr. Jacquin, Eclog. Pl. Rar. **1**, p. 100, t. 67 (1811–16) has a full description and coloured plate of *C. graveolens*. Jacquin describes the tepals as tuberculose, and illustrates projections on the outer surface of the tepals ; I consider that these are clearly intended to represent the conspicuous glands of *C. botrys* and not the keel of *C. schraderianum*, especially as these projections are continued down the pedicel. Jacquin states that the University Garden at Vienna received seeds of *C. graveolens* in 1803 sent by Cavanilles from the Royal Botanic Garden at Madrid, and that the plant was communicated to several other botanic gardens. This is borne out by contemporary plant-lists. I feel little doubt that the plant illustrated by Jacquin was *C. botrys* L. in a luxuriant condition.

Dr. Aellen, however, maintains (*in litt.*) that Jacquin's plate portrays *C. schraderianum*. While admitting that the mode of branching of Jacquin's plant is perhaps more suggestive of *C. schraderianum* than of *C. botrys*, I consider that this is not a constant character and that it is outweighed by the evidence of the perianth, mentioned above. Dr. Aellen also writes that he has examined plants in Herb. Stockholm (Herb. Swartz) whose seeds were sent from Madrid by Lagasca to Willdenow, and that they are certainly *C. schraderianum.* It is thus probable that both *C. botrys* and *C. schraderianum* were at that time passing under the name *C. graveolens* in botanic gardens.

If, as I suggest, the plant in Lagasca's own herbarium, although not a type, be taken to represent his concept of *C. graveolens,* then the latter name becomes a synonym of *C. botrys.* Otherwise, in the absence of a type, we must assume that both *C. schraderianum* and *C. botrys* were grown or sent out by Lagasca as his *C. graveolens,* which must thus be regarded as a *nomen dubium* ; Lagasca and Rodriguez ' original description is altogether unhelpful in making a choice between the two species concerned. Whichever view is taken *C. graveolens* Lag. et Rodr. is taxonomically invalid and is to be rejected.

The name *C. schraderianum* Schult., Syst. Veg. **6,** 260 (1820) (*C. foetidum* Schrad. in Magaz. Ges. Naturf. Freunde Berlin, 79 (1808), nom Lam., Fl. Fr. **3,** 244 : 1778) is used here in its traditional sense of applying to the tropical African species with keeled tepals ; this is the usage of the Flora of Tropical Africa, and of Dr. Aellen and Professor Ulbrich among recent writers on the genus. I have not seen Schrader's original description, and although Willdenow's almost contemporary account of *C. foetidum* Schrad. (Enum. Hort. Berol. 289 : 1809) is very short and does not mention the tepals, I feel it wise not to disturb the established usage until evidence can be found to disprove it. It should be noticed, however, that *C. foetidum* Schrad., a name still in common use, must be abandoned as being a later homonym—a fact recognised long ago by Schultes when he devised the name *C. schraderianum* to replace it.

Dr. Aellen, in Verhandl. Naturf. Gesellsch. Basel, **41,** 106 sqq. (1930), rejecting the name *C. graveolens* Lag. et Rodr. for reasons already discussed, uses the name *C. graveolens* Willd., Enum. Hort. Berol. 290 (1809) for a distinct American species for which Dr. Aellen had, in his previous " Beitrag zur Systematik der Chenopodium-Arten Amerikas " in Fedde, Repert. **26,** 39 (1929), used the name *C. incisum* Poir. However, *C. graveolens* Lag. et Rodr. being validly published, *C. graveolens* Willd. is a later homonym, and *C. incisum* Poir. in Lam., Encyl. Méth. **1,** 392 (1810) must apparently be restored as the correct name for the American species.

The conclusions reached in this paper may be briefly summarised as follows :—

(1) *C. graveolens* Lag. et Rodr. is a validly published name, its rejection on the ground of the non-employment by its authors of binomial nomenclature being due to a misapprehension.

(2) On the evidence of a specimen from Lagasca's herbarium, and of my interpretation of a plate in Jacquin's Eclogae Plantarum made from a plant said to have been grown from seed sent from the Madrid Botanic Garden, *C. graveolens* Lag. et Rodr. is conspecific with and thus a synonym of the European *C. botrys* L.

According to Dr. Aellen, plants in Herb. Stockholm from seed sent by Lagasca to Willdenow are certainly *C. schraderianum,* and he considers

Jacquin's plate also to be this species. On this view, since no type-specimen was kept and the original description is indefinite, *C. graveolens* Lag. et Rodr. must be rejected as a *nomen dubium* applied both to *C. botrys* and *C. schraderianum.*

(3) *C. graveolens* Lag. et Rodr. is thus not, as generally assumed, a synonym of the African species usually called *C. foetidum* Schrad. ; the latter name is a later homonym and the African plant must therefore be called *C. schraderianum* Schult.

(4) Although the original or contemporary descriptions of *C. foetidum* Schrad. and *C. schraderianum* Schult. are indefinite, it seems best to maintain their generally-accepted application to the African species until evidence against this is found.

(5) *C. graveolens* Willd. is a later homonym of *C. graveolens* Lag. et Rodr. The American species called by the former name must revert to its next available name which is apparently *C. incisum* Poir.

I must thank Mr. J. E. Dandy of the British Museum (Natural History), who first pointed out that *C. graveolens* Lag. et Rodr. was a legitimate name ; I am further indebted to Mr. Dandy for a transcription of the original description of this species.

Water in Plants.*—It is impossible to overate the importance of water in relation to plants, and thus there has grown up a very extensive literature on the subject so that, although some eight hundred references are cited in the work before us, the bibliography is far from exhaustive. Nevertheless the student will find here a most useful survey of work in this field, and the authors have admirably fulfilled their expressed aim to provide a reference work to this topic which should stimulate further reading. The introductory chapters on modern views of the structure of water and solutions are the more necessary, since physiologists are all too apt to treat of the moisture relations of plants as though water were a simple medium of a uniform character, uncomplicated in its functional effects by co-ordinations or binding forces. All types of bonding forces are probably involved, for example, in the phenomenon known as 'bound water', that has been held to play a part in drought and frost resistance, yet this has been treated as a separate state rather than a degree in a continuum of electrochemical forces. There are also useful chapters on osmotic phenomena, the water relations of the active cell, water uptake and movement, and the problems of water retention and loss. It is perhaps in these latter chapters that the reader may feel a more extended treatment would have been desirable to adequately meet the claim as a work of reference, which is obviously and probably desirably orientated from the physiological laboratory rather than the field, but a more extended treatment of the ecological aspects could have appreciably enhanced its value.

E.J.S.

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*Water in the Physiology of Plants : by Crafts, Currier and Stocking. The Chronica Botanica Co., Waltham, Mass., U.S.A. ; Wm. Dawson & Sons, Ltd., London, W.C.2. Price $6.00.

CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : LI*.

ON TWO EUPHORBIACEAE OF BRITISH GUIANA.

N. Y. SANDWITH.

Haematostemon guianensis *Sandwith*, sp. nov. ; ab *H. coriaceo* (Bth. ex Baill.) Pax et K. Hoffm. foliis oblanceolatis apice abruptius acuminatis basi ipsa satis late et conspicue rotundato-cordatulis subauriculatis marginibus remotius atque multo minus obvie denticulatis, filamentis floris masculi basin versus dilatatis sed haud ut in *H. coriaceo* basi ipsa in glandulas tumidas obvias a sese distinguendas elevatis differt.

Arbor parva, ramulis junioribus pilis flavicantibus subadpressis pubescentibus. *Folia* oblanceolata, apice conspicue (1–1·5 cm.) satis abrupte acute acuminata vel cuspidata, basin versus sensim attenuata atque basi ipsa abrupte satis late (5–9 mm.) rotundato-cordatula atque plus minusve auriculata, 10·5–26·5 cm. longa, 3·4–7·8 cm. lata, chartacea, marginibus plus minusve sinuatis remote et plerumque obscure calloso-denticulatis denticulis a sese 0·7–1·5 cm. semotis, costa nervisque primariis inconspicue adpresse pubescentibus exceptis glabra, siccitate supra solemniter brunnea subtus multo pallidiora, costa supra tenuiter prominula subtus prominente, nervis primariis utroque costae latere 10–12 inferioribus angulo angusto acuto (c. 40°) alte subrecte ascendentibus ceteris latius arcuato-ascendentibus atque marginem versus anastomosantibus, his supra tenuissime prominulis subtus planis, nervis secundariis supra impressis subtus obviis planis pulchre parallelis, venulis utrinque impressis ; petiolus 3–5 mm. longus, copiose adpresse flavicanti-pubescens. *Racemi* axillares et terminales, inferne nudi, 8–14 cm. longi, graciles, saepe flexuosi, pubescentes ; flores inferne ♀, dissiti, tum ♂ fasciculati, flos terminalis ♀ ; bracteae lineari-lanceolatae, ad 1·5 mm. longae, basi circiter 0·4 mm. latae, saepius falcato-recurvae. *Flores masculi* pedicellis saepe flexuosis parce pubescentibus 2·5–3·3 mm. longis sustenti ; sepala 4, ovata vel ovato-oblonga, basi cohaerentia, acutiuscula apicibus inflexis, 1·3–1·75 mm. longa, 1–1·3 mm. lata, costa mediana elevata, intus crebre verruculosa, extra parce pubescentia ; stamina 4, filamentis 0·5–0·6 mm. longis basin versus gradatim dilatatis et basi ipsa cohaerentibus sed haud ut in *H. coriaceo* e glandulis tumidis obviis a sese distinguendis exorientibus, antheris usque ad 0·3 mm. longis. *Flores feminei* pedicellis 2–3·5 mm. longis dense albido-pubescentibus infra medium articulatis sustenti ; sepala ut videtur 4, scilicet 3 majora ovato-lanceolata obtusiuscula 1·5–2 mm. longa 0·8–1 mm. lata, interjecto quarto multo minore lanceolato 0·75–1·5 mm. longo 0·3–0·5 mm. lato, omnia extra pubescentia ; ovarium loculis globosis circiter 1 mm. diametro exalatis crebre obtuse verruculoso-muriculatis ; stylorum columna obovoideo-oblonga vel turbinato-clavata, 2·5–3·2 mm. longa, 1·75–2·2 mm. diametro, extra praesertim superne sparse pubescens praeterea superne leviter sulcata ceterum laevis, apice truncata atque depresso-concava, margine vel extra sub margine consociebus tribus dentium brevissimorum ad 0·2 mm. longorum obtusorum plus minusve conicorum praedita. *Fructus* non visus.

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*Cont. from K.B. 1949, p. 493.

British Guiana. Eagle Mountain, on watershed of Potaro and Konawaruk Rivers, in forest on lateritic ironstone soil, Jan. 25th 1943, *D. B. Fanshawe* in *Forest Department* no. 3859 : " 15 ft. tree of Kakaralli–Clump Wallaba forest ; leaves supple ; fls. in axillary and terminal spikes, pinkish-buff ; young fruit oblong, ribbed, green ".

Haematostemon, *Astrococcus* and *Angostylis* are three closely allied genera of the subtribe *Plukenetiinae*, until recently all monotypic and known only from the upper Rio Negro region near the borders of Brazil and Venezuela, where they occur as small monoecious trees up to about 20 ft. in height. The generic distinctions are taken from characters of the inflorescence, flowers and fruit. Mr. Fanshawe's very interesting new species certainly fits into *Haematostemon* on these characters, but the leaves resemble those of *Angostylis longifolia* Bth. and are not at all like those of *Haematostemon coriaceus* (Bth. ex Baill.) Pax et K. Hoffm. Moreover, the filaments of the 4 stamens of *H. guianensis* are dilated gradually and evenly to a scarcely disk-like centre where they cohere, whereas in *H. coriaceus* the filaments arise from conspicuous raised swollen disk-glands in the centre of the flower. The knobs at the top of the style column of the female flower of *H. guianensis* are very short and disposed in three distinct fields, and only 4 sepals have been observed. The related genus *Astrococcus* Bth., from which Pax and Hoffmann segregated *Haematostemon*, not only has remarkable horned carpidia, but also has a very different male flower : the 4 stamens are situated within a very distinct disk which is shallowly cup-shaped like a *Peziza*. The present writer found this disk to be continuous and irregularly sinuate with a raised thickened margin, not broken up into separate glands as described by Pax and Hoffmann. The third genus, *Angostylis* Bth., lacks the characteristic long spike-like inflorescence of the two others, its much larger male flowers with 3 sepals have about 20 stamens on a conical columnar receptacle, and the style column of the female flowers is deeply lobed.

Recently, in Bull. Torr. Bot. Cl. **75,** 403 (1948), a plant collected on the Tafelberg in Surinam was described by L. Croizat as a new species, *Angostylis tabulamontana*, but the author admitted that the genus was " entirely speculative ". Apparently, he had before him only branchlets, leaves and a single " submature " capsule. Whatever it may be, *A. tabulamontana* is certainly nothing like *Haematostemon guianensis* on account of its short narrow leaves which are cuneate at the base into a long petiole and have about 7 pairs of nerves.

Dodecastigma integrifolium (*Lanj.*) *Lanj. et Sandwith*, comb. nov.—*Pausandra integrifolia* Lanj. in Kew Bull. **1932,** 183 ; in Rec. Trav. Bot. Néerl. **33,** 769 (1936). *Dodecastigma mazarunense* Croizat in Bull. Torr. Bot. Cl. **75,** 404 (1948).

Prof. Lanjouw at first described this tree as a new species of *Pausandra*, making it the basis of a new section, *Pausandrella*, characterised by the trimerous flowers, with free sepals and petals, and the entire leaves. Four years later, in a revision of *Pausandra*, he excluded *P. integrifolia* and suggested the highly probable affinity of this species with the monotypic genus *Dodecastigma* Ducke, described in 1932, preferring to postpone transference until good material of the female inflorescence had been collected. In September, 1937, I re-collected the species in the type locality on the lower Cuyuni River but found only two flowering trees, each with male flowers. Dr. Leon Croizat has now described a new species of *Dodecastigma* from British Guiana Forest Department (coll. Fanshawe) material with male flowers and fruit which agrees perfectly with *Pausandra integrifolia.* This material, from the Takutu Creek to the Puruni River, Mazaruni River, once again lacks the female flowers. The most recent collection is a fruiting one, *Forest Dept.* 5503, from the Kumakuma Creek, lower Mazaruni River, where the tree is common in the understorey of mixed forest.

Prof. Lanjouw agrees with me that the above new combination should be made without further delay. *D. integrifolium* is, indeed, strikingly similar to *D. amazonicum* Ducke both in the facies of its leaves and male inflorescence and in the general structure of its male flowers and fruits. As pointed out by Prof. Lanjouw, it is at once distinguished by the trimerous male flowers with fewer stamens. Further distinguishing characters have now been found in the male flowers and in the fruit. In *Forest Dept.* 4764 (a collection cited by Croizat) I found the three petals to be 7 mm. long and up to 6 mm. wide, ovate-elliptic (but not also obovate), with the margins incurved and the apex recurved, adpressed-pubescent all over the outer surface except near the margin. The 9 stamens had filaments much longer than the anthers, 3–3·5 mm. long, while the anthers were up to 1·3 mm. long. In *Herb. Jard. Bot. Rio* 23543 (the type collection of *D. amazonicum*), the four petals were smaller (6–6·3 mm. long, 4·5–5 mm. wide), ovate-orbicular (outer) and ovate-elliptic (inner, smaller). The 13–16 stamens had short filaments 1·5–2·5 mm. long, glabrous though sometimes becoming sprinkled with hairs from the densely clothed disk, about equalling (now a little shorter, now a little longer than) the anthers which were from 1·8 to 2·2 mm. long. Some of the sepals of both species have a membranous petaloid appendage at the apex : in *D. amazonicum* it is the two inner sepals which bear broad almost wing-like appendages broader than the laminae and more or less surrounding their upper third. In both species, again, the sepals are more or less united below, even in the open flower : they are not " free " in *D. integrifolium,* as described by both Lanjouw and Croizat.

The fruits and seeds of the two species seem to give good distinguishing characters, although these need testing by further collections. Lanjouw described the fruits of *Pausandra integrifolia* from the few very poor, quite immature examples which were available with the type material, but Croizat was able to give a description of the advanced capsules and seeds of *Forest Dept* 4878, and *Forest Dept* 5503, with dehisced cocci, is now at Kew. Mature dehisced fruits and seeds of *D. amazonicum* (*Herb. Jard. Bot. Rio* 24875, collected and determined by Ducke) are also represented at Kew so that a comparison can be made. The fruits of *D. amazonicum* are considerably larger than those of *D. integrifolium* at a comparable stage of development. The dehisced cocci of the former are 2·4 cm. high and 3 cm. broad, whereas the cocci of the latter are up to about 1·8 cm. high and 2·5 cm. broad. The seeds of the two species are quite distinct, on present evidence, in size, colour and markings. Those of *D. amazonicum* are, as described by Ducke, 2 cm. long, 1·8 cm. broad and 1·4 cm. thick, and they are brown with a darker brown, rather inconspicuous, irregular mottling of lines and spots but lacking minute dots. The seeds of *D. integrifolium* are up to 1·6 cm. long, 1·3 cm. broad and 1 cm. thick, and are far more variegated in colour than those of *D. amazonicum* since the surface is pale brown while the conspicuous irregular mottling of lines and spots is black, and there is also a copious, fairly regular and very distinctive sprinkling of small black dots. The attachment scars are, of course, proportionately different in size in the seeds of the two species.

***British Plant Life.**—The author of this volume has devoted a great deal of attention to British Plants over a period of many years and in this work, which forms a notable contribution to the literature of the subject, he presents in a very thorough manner the knowledge and experience gained from his observations and protracted studies.

The book is divided into fourteen chapters ; after the introduction, the evolution of plant life, the influence of the ice age on our native flora, and the floristic changes of the post-glacial period are dealt with. A discussion of the present position and the geographical relationships of the British flora is followed by a consideration of plant communities, their development and modification. The author then goes on to deal, with variation, adaptation and natural selection, the study of heredity, and continuing changes in British plants. In the last chapter he suggests various lines of research for the future and finally emphasises the importance of the institution of National Reserves and National Parks, and the ownership of areas by the National Trust.

Profusely illustrated, the book contains fifty-three delightful colour photographs and twenty-seven others in black and white. In addition there are eight maps illustrating distribution, and one showing the botanical vice-counties. The seven appendices contain a list of vice-counties, technical guides to taxonomic methods, biometrics, ecological methods, basic outlines of cytology and genetics, and the more important county and local floras. A list of references to serve as a guide to students for further reading and as a check to information given in the text, is followed by a useful bibliography, a glossary of technical terms and a very complete index.

Dr. Turrill has gathered together within the compass of a single volume, a wealth of information illustrating modern trends of botanical research which will be read with great interest by all serious students of the British flora.

H. S. MARSHALL.

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*British Plant Life : by W. B. Turrill (New Naturalist Series) pp. xvii Æ 315, 53 col. & 27 uncol. ill., 8 maps. London : Colins, 1948. Price 21s. 0d.

ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XXII.*

THE RHIZOPHORACEAE, BARRINGTONIACEAE AND CUCURBITACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932.

H. K. AIRY SHAW.

RHIZOPHORACEAE

Carallia brachiata (Lour.) Merr. in *Philipp. Journ. Sci.* **15,** 249 (1919), et in *Trans. Amer. Philos. Soc.* n.s. **24** (2), 281 (1935).

Diatoma brachiata Lour. *Fl. Cochinch.* 296 (1790).

Carallia lucida Roxb. *Pl. Corom.* **3,** 8, t. 211 (1819) ; Merr. in *Journ. Straits Br. Roy. As. Soc.* **1921,** Spec. no., 421 (1921).

Dulit, river bank forest, under 300 m., 18 Aug., *Synge* for *Richards* 1332 : " Tree, *c.* 25 ft. [7·5 m.] high ".

Gynotroches axillaris Bl. *Bijdr.* 219 (1825) ; Merr. in *Journ. Straits Br. Roy. As. Soc.* **1921,** Spec. no., 420 (1921).

Dulit, forest by torrent, under 300 m., 24 Aug., *Native Collector* for *Richards* 1430 : " Small tree. Flowers greenish white ".

BARRINGTONIACEAE

Barringtonia (§**Butonica**) **rhodochlamys** *Airy Shaw,* sp. nov., affinis *B. curranii* Merr., quacum indumentum minutum ferrugineum receptaculi et calycis communem habet, sed ob bracteas magnas papyraceas rubras in genere distinctissima.

Arbor parva, 3–4 m. alta. *Folia* ingentia, oblanceolato-spatulata, fere metralia, usque 21·5 cm. lata, basi sensim angustata, in petiolum pro rata brevissimum (3–4 cm.) usque 1 cm. crassum decurrentia, apice . . . . (deficiente), margine integro vel minutissime et obscurissime denticulato, firme chartacea, glaberrima, costa valida utrinque prominente nervis primariis lateralibus circiter 60-jugis late patulis rectis basin versus crebris et valde plicato-bullatis prope marginem arcuato-anastomosantibus utrinque argute prominulis, nervis secundariis inter primarios plus minus scalariformiter dispositis cum minoribus reticulum conspicuum efformantibus. *Inflorescentia* (immatura) 26 cm. longa (teste *Richards*), pendula, rhachi valida usque 1·7 cm. crassa rugosa minute fulvo-furfuracea. *Bracteae* magnae, papyraceae, laete rubrae (teste *Richards*), plus minus ovatae vel orbiculares, valde convexae (velut ' inflatae '), usque 7 cm. longae et 4 mm. latae, crebre et sine ordine inter flores insertae, alabastra omnino obtegentes. *Flores* (ex alabastris submaturis tantum cogniti) in axi crebre inserti, subsessiles vel breviter stipitati, alabastro globoso usque 1·5 cm. diametro. *Calycis tubus* (' receptaculum ') obovoïdeus usque ellipsoïdeus, obtuse vel acute tetragonus, lateribus concavis, stipite (1–3 mm.) incluso usque 13 mm. longus, usque 6 mm. diametro, ut in *B. curranii* omnino minute ferrugineo-furfuraceus. *Sepala* 4, orbicularia, 1·7 cm. diametro, tenuissime herbacea, fere membranacea, pulchre venosa, valde concava. *Petala* 4, sepalis simillima, sed crassiora et paullulo minora. *Stamina* valde numerosa, in alabastro in massam globosam ± spiraliter disposita,

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*Continued from *Kew Bull.* **1949** (2), 165 (1949).

antheris ellipsoïdeis vix 1 mm. longis. *Stylus* teres, circiter 2·5 cm. longus, stigmate punctiformi. *Ovarium* 4-loculare, dissepimentis tenuibus, ovulis in quoque loculo circiter 4 ab apice pendulis. *Fructus* ignotus.

Dulit, secondary forest, under 300 m., 23 Aug., *Richards* 1400 : " Tree, *c.* 3–4 m. high. Inflorescence 26 cm. long. Bracts bright red.

This remarkable species is unfortunately represented only by a single leaf, with the apex imperfect, and a very short section of the inflorescence (barely 1 cm.) with rather advanced flower-buds. In all characters except the bracts it appears to be closely allied to *Barringtonia curranii* Merr., a species known from Palawan and North Borneo (and also, according to Knuth, from Luzon), but in the large bright red papery bracts, disposed quite densely amongst the flowers, it differs from all other known species of the genus. Its evident close relationship to the more normal *B. curranii* precludes the erection of a separate section merely on the basis of the bract-character.

CUCURBITACEAE

Gynostemma simplicifolium Bl. *Bijdr.* 24 (1825) ; Merr. in *Journ. Straits Br. Roy. As. Soc.* **1921,** Spec. no., 585 (1921).

Dulit, forest by torrent, under 300 m., 24 Aug., *Native Collector* for *Richards* 1436 : " Small climber. Fls. green ".

NEW OR NOTEWORTHY SPECIES OF GONYSTYLUS AND RELATED GENERA.

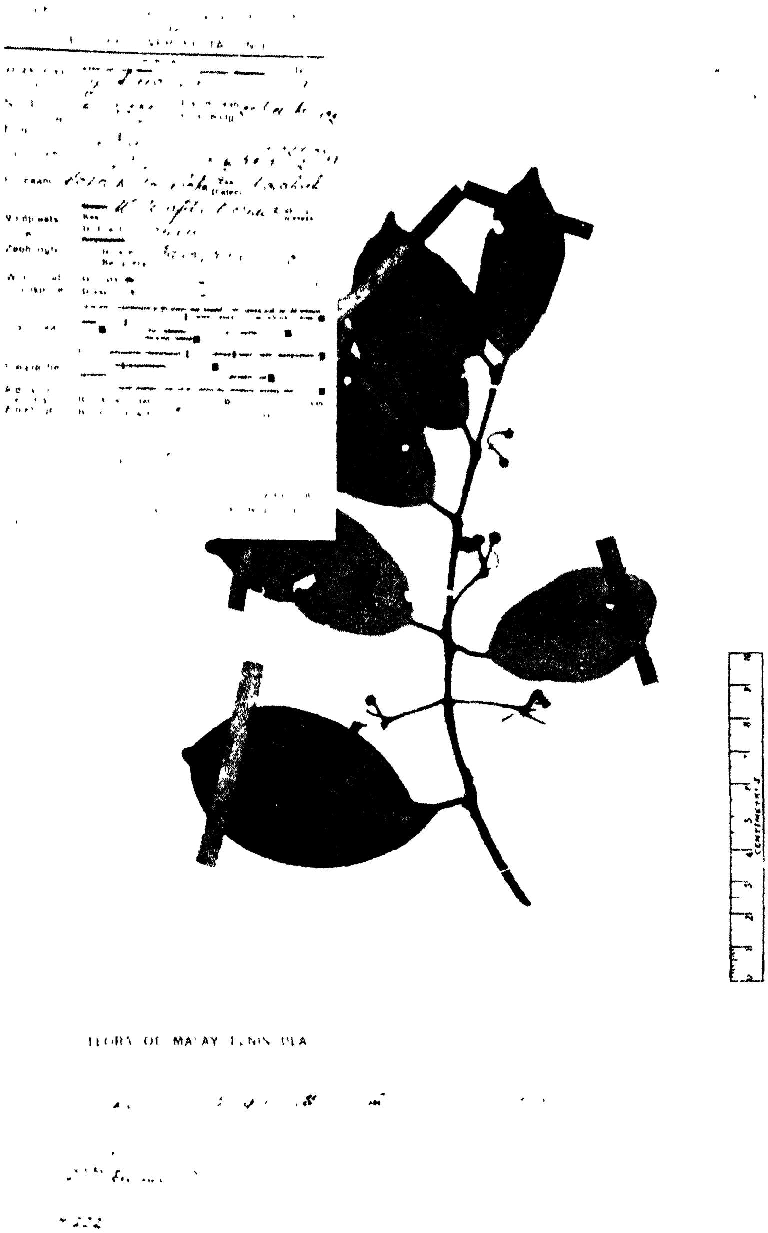
H. K. AIRY SHAW.

The opportunity has recently been afforded of examining the material of *Gonystylus* preserved in the herbaria at the Forest Research Institute, Kepong, Malaya, and at the Botanic Gardens at Buitenzorg and Singapore, in connection with the account of this group to be written for the *Flora Malesiana.* As was to be expected, a number of undescribed species were found. Descriptions of those of which the material was adequate are supplied herewith, but there remain an equal, if not greater, number, represented by sterile specimens only, the description of which must await the eventual collection of flowering material. It is clear that the genus *Gonystylus* comprises a considerable number of species, but that many of them are distinguished mainly by somewhat obscure vegetative characters—size, texture, venation and indumentum of leaves, and especially colour on drying—characters often easy enough to observe but much less easy to put into words. Good characters are, however, often found also in the flowers—mainly in the shape of the sepals and in the number and setulose or glabrous condition of the petals—and it therefore appears unjustifiable to describe new species from sterile material, even though sterile material can usually be assigned with some confidence to its proper species.

GONYSTYLUS SECT. EUGONYSTYLUS

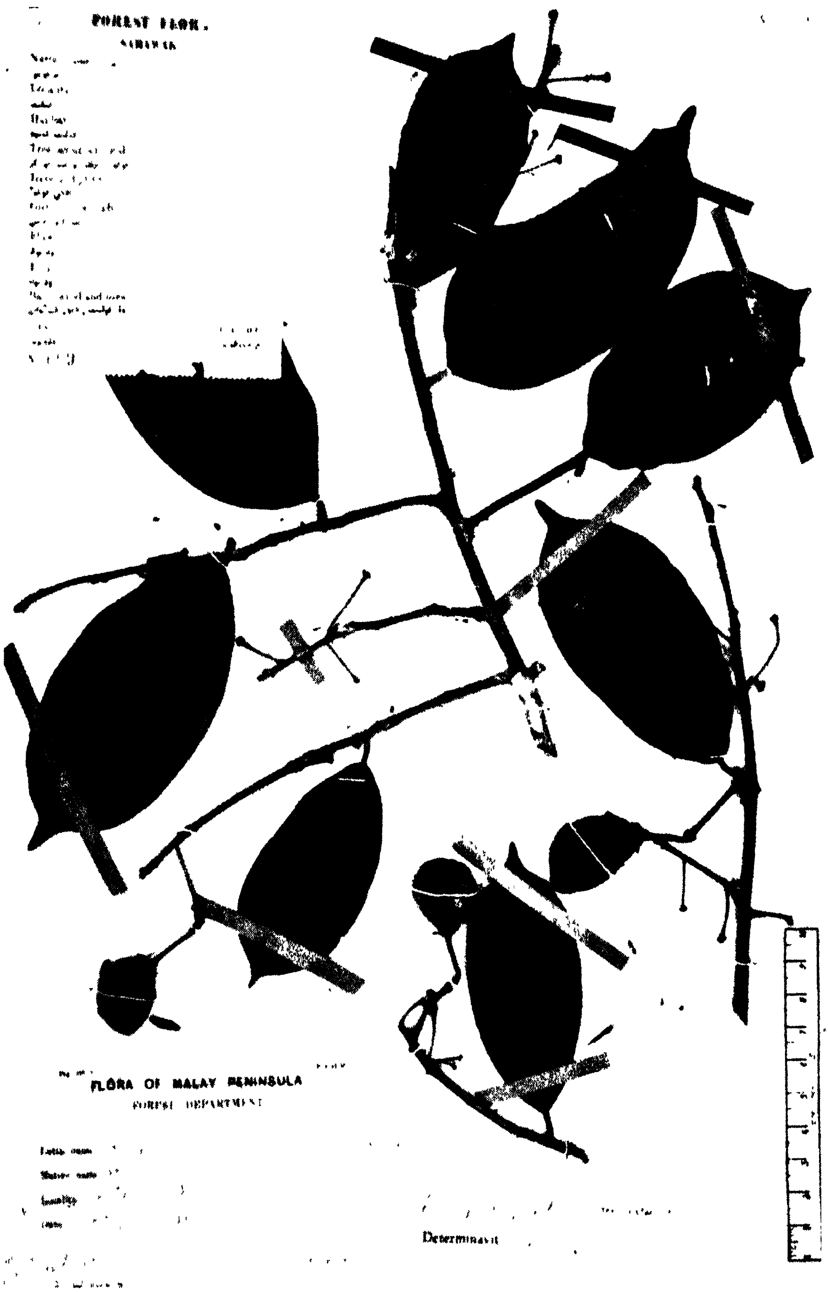
Gonystylus brunnescens *Airy Shaw*, sp. nov., ob petala setulosa forsan *G. keithii* A.S. maxime affinis, sed foliis crassius coriaceis siccitate utrinque

PLATE 5



Aetoxylon sympetalum (v. St. et Domke) Airy Shaw. Flowering branch. Photograph of part of type collection (Herb. Kepong)

PLATE 6



Aetoxylon sympetalum (v. St. et Domke) Airy Shaw. Fruiting branches.
Photograph of Egon A. 0901 (Herb. Kepong).

castaneis (nec supra viridulis) crebrius parallelo-nervosis, floribus fere duplo minoribus, petalis haud pustulatis recedit.

Arbor 21–23 m. alta. *Ramuli* 3–4 mm. crassi, cortice striato fusco. *Folia* elliptica usque oblonga, 12–26 cm. longa, 4–10 cm. lata, basi ± cuneata usque rotundata, apice ± rotundata in acumen breve deflexum subabrupte angustata, margine reflexo, firme coriacea, siccitate utrinque castaneo-brunnea, glaberrima, supra 'chagrinata', subtus sub lente interdum nigro-puncticulata sed vix chagrinata ; nervi laterales numerosi, graciles, crebri, late patuli, prope marginem anastomosantes, utrinque prominuli ; venulae minores manifestae vel subtus subobscurae; petioli 12–15 mm. longi, 1–3 mm. crassi, rugoso-striati, juniores minute adpresse puberuli, mox glabri. *Inflorescentiae* terminales, simplices vel pauperrime thyrsoïdeae, 4–11 cm. longae, tenuiter adpresse ochraceo-pubescentes, fasciculis florum 1–2 cm. distantibus saepe breviter (usque 5 mm.) pedunculatis. *Pedicelli* circiter 5 mm. longi, dense adpresse ochraceo-pubescentes. *Flores* (an maturi ?) circiter 7 mm. diametro, dense ochraceo-sericei. *Calyx* basi truncatus et gibbosus ; *sepala* ovato-deltoïdea, 4–5 mm. longa, circiter 3 mm. lata, obtusiuscula. *Petala* 25–30, subulato-filiformia, circiter 3 mm. longa, extra glabra, intus ± dense retrorso-hispida, haud pustulata, inferne varie connata. *Stamina* brevissima, circiter tot quot petala. *Ovarium* subglobosum, circiter 4 mm. diametro, dense ochraceo-pubescens. *Stylus* circiter 3 mm. longus, glaber. *Fructus* (vix maturus) globosus, 3·5–4 cm. diametro, trilocularis, ut videtur indehiscens.

MALAY PENINSULA : KEMAMAN (Trengganu–Pahang border). Bukit Kajang, 150 m., 14 Nov. 1935, *Corner* 30462 (fl.) : " 60 ft. tree, slightly fluted at base, inner bark deep pinkish brown, fibrous, stripping, thick ; outer bark fuscous fawn, somewhat flaky fissured, v. faintly marked with rows of lenticels, not rugose, no leaf-scars, wood pinkish buff. Leaves with edges slightly recurved, dark green above. Sepals green. Petals (or corona of filaments) white. Stamens with v. slender white filaments and yellow anthers ; ovary pale yellowish ; style and stigma white ". Id. ibid., 15 Nov. 1935, *Corner* 30471 (fl.) : " 70 ft. tree, monopodial like a *Garcinia* or *Polyalthia* : branches crowded towards the top, passing obliquely upwards, not much curving out. Bark fuscous brown, rather fissured flaky but not very much, slightly scaly, uneven, finely and shortly creviced-fissured ; inner bark pale ochraceous white, rapidly browning on exposure, thick, the outer dead bark brown ; wood pale buff. Resembles a 'Polyalthia ' in habit and colour of bark, but no leaf-scars and bark is not smooth ".

DUTCH BORNEO : West Division. Melawi : B. Melaban Ketjie, 345 m. alt., 25 June 1939, *L. Budding* 326 (Boschbouwproefst. b.b. 28350) : " Tree, 21 m. high, a few examples together, on sandy clay, sloping ground, old primary forest, very common. Dayak name : *mahabai binjak* ". Melawi : Ng. Betoeng, B. Goentoek Kajan, 250 m. alt., 11 Oct. 1939, *L. Budding* 417 (b.b. 29629) (typus, Herb. Bogor.) : " Young tree, 22 m. high, scattered, on clay, sloping ground, old primary forest, rather common. Dayak name : *lemiar* ". Melawi : Ng. Betoeng, B. Moenggoek, 175 m. alt., 29 Jan. 1940, *Mas Soedarsono* 15 (b.b. 31633) : " Tree, 23 m. high, rather scarce, scattered, clay soil,

sloping ground, old primary forest. Dayak name : *gerima*".—The following sterile specimens are also possibly referable here : *Boschbouwproefst.* b.b. 8311 (*seriangoen*) (25 May 1925, *B. de Jong* 496/WB), and 11350 (*medang kelik*) (Paloh, 12 Feb. 1926, *Bianchi* 22).

BRUNEI. Pak Gabah (?), ridge, 7 May 1938, *For. Gd. Ba'ae* for *Flemmich* 34575 : " Height 45 ft., girth at breast height 3 ft. Vernacular name : *kelat* " [=*Eugenia, Syzygium*].

NORTH BORNEO. Mount Kinabalu : Dahobong river, c. 1050 m. 5 March 1933, *C. E. Carr* (Singapore Field No.) 26391 (fr., Herb. Singap.). Ibid., Gurulau Spur, jungle spur at tent corner, 1500 m., 4 Dec. 1933, *Clemens* 50705 (young buds ; Singap.) : " Tree, 15 inches by 50 feet. Buds only, on terminals, brown ".

This species is apparently near to *G. keithii* A.S., but differs in its more coriaceous leaves which dry more or less chestnut brown on both surfaces, those of *G. keithii* drying dull purplish-brown beneath and greenish above with a narrow dark purple margin. The petals of *G. brunnescens* are densely retrorse-setulose within, as in *G. Keithii*, but are non-pustulate. The flowers are subject to the attacks of a gall-making insect, galled flowers being present both on *Corner* 30471 and on *Budding* 417.

Gonystylus velutinus *Airy Shaw*, sp. nov., affinis *G. maingayi* Hook. fil. et *G. forbesii* Gilg, sed foliis subtus molliter velutino-pubescentibus, fructu subduplo majore distincta.

Arbor, statura ignota. *Ramuli* annotini fusci, plus minus tomentelli vel cito glabrescentes ; novelli dense fulvo-velutini. *Folia* plus minus elliptica, oblongo-elliptica vel lanceolato-elliptica, (6) 8–11 cm. longa, (2·5) 3·5–5 cm. lata; basi cuneata usque subrotundata, apice breviter sed anguste cuspidato-acuminata, cuspide 2–5 mm. longa, supra glabra, manifeste ' chagrinata ', subtus in statu juvenili dense fulvo-velutino-pubescentia, maturitate etiam saepe evidenter pubescentia, sed interdum tantum sub lente minute puberula, chartaceo-coriacea, siccitate obscure brunnea vel ochracea ; costa supra anguste canaliculata, subtus prominens ; nervi gracillimi, crebri, paralleli, late patuli, leviter procurvi vel subrecti, utraque pagina (sed magis infra) prominuli ; petiolus 7–11 mm. longus, 1–2 mm. diametro, supra anguste vel late canaliculatus, dense velutinus. *Inflorescentiae* terminales et axillares, 7–12 cm. longi, subfulvo-tomentelli, ramis 1–2 primariis ramulos complures brevissimos (usque 1 cm. longos) patentes racemose dispositos gerentibus, ramulis flores usque circiter 6 irregulariter gerentibus. *Flores* parvi, circiter 5 mm. diametro (expansi), pedicello 8–10 mm. longo tomentello insidentes ; alabastra ovato-acuminata, 3 mm. longa. *Calycis* tubus depresso-globosus, 3 mm. diametro, rugulosus, tomentosus ; segmenta deltoïdea, circiter 3 mm. longa, 3 latiora, 2 angustiora, acuta, valde revoluta, utrinque dense tomentella. *Petala* 7–8, deltoïdea, acuta, 2 mm. longa, incurva, glabra. *Stamina* ut videtur circiter 10. *Ovarium* subglobosum, 1·5–2 mm. diametro, dense setulosum, stylo filiformi glabro 3 mm. longo, stigmate clavato. *Capsula* lanceolato-oblonga, 3·5–5·5 cm. longa, valde lignosa, in valvas 3 (rarius 2) loculicide dehiscens ; valvae 1·3–2 (rarius 2·5) cm. latae, 5 mm. crassae, extra fusco-brunneae,

rugulosae, intus pallidae, sublaeves, maturitate late patentes vel subreflexae. *Semina* 1–3, lanceolato-ovoïdea, dorsiventraliter compressa, 2·5–3 cm. longa, testa fusco-brunnea laevi nitente, arillo oblongo circiter 8 mm. lato ventraliter carinato secus faciem internam per totam longitudinem extenso apice in appendicem breviter caudiformem producto.

SUMATRA. Palembang : sine loc. exact., 21 Jan. 1921 (foliage), 11 Oct. 1922 (v. young fr.), 21 and 25 Jan. 1923 (mature fr.), *L. J. W. Dorst* 15T/1P/21 ; vernacular name, *kajoe minjak* [*kayu minyak*=wood oil]. Ibid., 30 Oct. 1922 (foliage), 16 Oct. 1923 (fl.), 20 Jan. 1924 (fr.), 29 Apr. 1924 (seedlings), *L. J. W. Dorst* 15T/3P/812 (type) (presumably all from same tree) ; vernacular name, *oeloe toepai* [*ulu tupai*= squirrel's head]. Ibid., Moesi Iliren Koeboe region, 'Dekat doesoen Mangsang marga Koeboe-lalam, Tanggal,' 12 August 1934, *Pako* 7/VII (bb. 18655) (sterile) ; vernacular name, *kajoe minjak.*

The following, mostly sterile specimens are probably referable to this or a closely related species :—

SOUTH-EAST BORNEO. Sine loc. exact, 27 April 1927, *C. J. van der Zwaan* 132 (bb. 11184). Id., 7 May 1932, *A. Atjil* 252 (OB. 2444 ; bb. 16908) ; vernacular name, *lempong.* Noenoekan Island, Boeloengan, 5 m. alt., 6 May 1939, *G. H. Henar* 50 (bb. 293 or 29341) ; vernacular name, *tebakau poetih* [white *tebakau*].

WEST BORNEO. Melawie, Ngebel Betoeng, B. Moenggoek, ± 175 m. alt., on clay soil, sloping ground, old primary forest, rather scarce, scattered, 29 Jan. 1940, *Nas Soedarsono* 14 (bb. 31632) (fr.) : "Tree, 43 m. high, 52 cm. diam. ; vernacular name, *besiloeh.* Beloengai, 30 May 1932, *W. Wattimena* 1 (bb. 17012) (ster.) ; vernacular name, *babingkal.*

SARAWAK. Sine loc. exact. vel dat., *F.M.S. For. Dept.* C.F. 7159 : "Bark smooth, 1/4 inch thick. Sap irritates flesh. Wood fine-grained, whitish. Uses : planks, house construction ".

This species forms, with *G. maingayi* Hook. f. and *G. forbesii* Gilg, a small group characterized by the recurving of the sepals at anthesis. The leaves of *G. velutinus* in the young state are more strongly pubescent than those of any other species so far known.

Gonystylus pendulus *Airy Shaw,* sp. nov., inter species parvifolias foliis fere oblongis (cf. *G. maingayi* Hook. f.) 9–11 cm. longis 3–4 cm. latis, inflorescentiis parvis tantum 2–3 cm. longis, floribus pro rata majusculis 8–9 mm. diametro sepalis haud reflexis satis distinctus.

Arbor parva, ramis elongatis pendulis (teste *Clemens*), cortice ramulorum fusco-brunneo. *Folia* parva, elongate oblongo-elliptica vel fere oblonga, 9–11 cm. longa, 3–4 cm. lata, basi cuneata vel rotundato-cuneata, apice breviter caudata (cauda 6–8 mm. longa subacuta), chartaceo-coriacea, supra glaberrima, subtus brevissime (et in junioribus subsericeo-) adpresso-pubescentia, siccitate supra griseo-viridula, subtus pallide viridulo-ochracea vel fuscescentia et anguste ochraceo-marginata, fere epunctata ; costa gracilis, basin versus supra leviter impressa ceterum vix impressa, subtus prominens, juventute subsericea ; nervi laterales numerosi, crebri, conspicui, valde reticulati, patuli et procurvi, 1–2 mm. a margine anastomosantes et nervum intramarginalem efformantes; petioli 8–10 mm. longi, rugulosi, supra canaliculati, pubescentes. *Inflorescentiae* (? an semper) parvae, 2–3 cm. tantum longae, subsimplices, tenuiter adpresso-pubescentes vel subsericeae. *Pedicelli* elongati, 1–2 cm. longi, sericei. *Flores* pro rata majusculi, cremei (teste *Clemens*), siccitate leviter rosei. *Calyx* campanulatus, 8 mm. longus et 10 mm. diametro, crassus, extra breviter adpresso-sericeus, ultra medium divisus, segmentis late vel anguste ovatis circiter 6 mm. longis 2·5–4·5 mm. latis obtusis intus convexo-incrassatis dense setosis. *Petala* circiter 30, anguste subulata, inferne 'solida', superne magis applanata et subsulcata, acuta, circiter 5 mm. longa, glabra, epustulata. *Stamina* circiter tot quot petala, circiter 3 mm. longa, antheris oblongis. *Ovarium* globosum, circiter 2 mm. diametro, dense setosum. *Stylus* filiformis, elongatus, contortus, inferne plus minus setosus, stigmate subclavato-capitato. *Fructus* ignotus.

SARAWAK. Mt. Poi, gorge of great rocks near upper zone, 1200 ft., 25 Sept. 1929, *M. & J. Clemens* 20011 (field no. 7125): "Tree, 35 ft. high, 5 ins. diam.; limbs pendent, viney; flower cream".

A distinct species, in its small almost oblong leaves, with close prominent reticulation, which somewhat recalls that of *G. forbesii* Gilg. In shape and reticulation the leaves are also not unlike smaller leaves of *G. punctatus* A. C. Smith, from Fiji. The small inflorescences, with relatively large flowers, which are externally shortly sericeous rather than tomentellous, are characteristic.

Gonystylus micranthus *Airy Shaw*, sp. nov. (aff. *G. Hackenbergii* Diels, teste Domke in sched. in Herb. Kepong), foliis subtus conspicue marginatis siccitate fusco-plumbeis, floribus parvis globosis 4–5 mm. diametro siccitate fuscis, petalis et staminibus circiter 10 in genere unicus.

Arbor circiter 18 m. alta, ramulis fuscis 3–4 mm. diametro glabris, novellis molliter breviter ochraceo-tomentellis. *Folia* elliptico-oblonga, 6·5–15 cm. longa, 3–6 cm. lata, basi rotundata vel latissime rotundato-cuneata, apice abrupte caudata (cauda 6–12 mm. longa circiter 2 mm. lata), anguste sed conspicue marginata, chartaceo-coriacea, siccitate fusco-purpureo-plumbea, subtus sparse puberula (costa densius), supra obscure (plerumque sub lente) puncticulata, haud 'chagrinata'; costa subtus prominens, supra anguste insculpta; nervi laterales numerosi, graciles, paralleli, late patuli, leviter procurvi, 1–2 mm. intra marginem anastomosantes; venulae minores transversae numerosae; petioli 8–10 mm. longi, 2–3 mm. lati, supra plani vel aperte canaliculati, glabri, fusci, subtus rugulosi, pubescentes. *Inflorescentiae* parum ramosae, usque 10 cm. longae, fasciculis florum 1–2 mm. stipitatis, molliter sed breviter ochraceo-pubescentes. *Pedicelli* graciles, usque 6 mm. longi, dense tomentelli. *Flores* in genere minimi (sed forsan nondum omnino maturi), globosi, 4–5 mm. diametro. *Sepala* ovato-deltoïdea, circiter 3 mm. longa, 1·5–2·25 mm. lata, subacuta, siccitate fusca, extra tenuiter puberula, intus dense sericea, basi in cupulam hemisphaericam connata. *Petala* circiter 10, subulata, 2–3 mm. longa, apicem versus ut videtur

paucipustulata. *Stamina* circiter 10, vix 2 mm. longa ; antherae oblongae. *Ovarium* circiter 2 mm. longum, dense fulvo-setulosum ; stylus filiformis, 3–4 mm. longus, valde geniculatus, stigmate parvo subclavato. *Fructus* ignotus.

SARAWAK. Semengoh Reserve, hilly ground, 9 Feb. 1935, *D. Garvill* for *J. P. Mead* 00004 (Herb. Kepong et Singapore) : " Tree c. 60 ft. high, 2 ft. girth. Bark dark brown, smooth. Wood coarse grained, moderately heavy, [used for] planks ".

I have not yet seen the type of *G. hackenbergii* Diels, with which this species is compared by Dr. Domke, but from the original description (in Engl. *Bot. Jahrb.* **60,** 310 : 1926) it differs from *G. micranthus* in the smaller, glabrous leaves, drying a pale colour on both surfaces, with longer petioles, and in the petals and stamens being twice as many and " dentiform ".

The buds on the only specimen available are just beginning to open, and hence have probably not quite attained their mature dimensions, but they give the impression that they will probably not enlarge much further. If this is the case, the flowers are much smaller than those of any other known species. In its few petals it is comparable only with *G. bancanus* (Miq.) Kurz and *G. forbesii* Gilg, but in these the petals are considerably broader, and the leaves never dry the curious purplish-leaden hue of *G. micranthus*. The latter character occurs also in *G. calophyllus* Gilg and *G. confusus* Airy Shaw, and in an undescribed species from the Lingga Archipelago, but these species differ widely in other respects.

GONYSTYLUS SECT. AUXANTHUS

Gonystylus augescens Ridl. in *Kew Bull.* **1946,** 43 (1946) ; Airy Shaw in *Hook. Ic. Pl.* **35,** t. 3474 (1947).

An older fruit than that described and figured in *Ic. Pl.*, l.c., but still immature, is present on the Singapore specimen of *Haviland* ' d.c.q.a. ' (=no. 488 in Herb. Kew, no. 29 in Herb. Singap.). It does, however, confirm that this type of fruit is probably normal for the species, and a description and drawing (fig. 1) are supplied herewith).

Fructus vetustior ut ille valde immaturus jam descriptus (*Hook. Ic. Pl.* t. 3474), sed latius lanceolatus, 5·5 cm. longus, 2·2 cm. latus, trivalvis, ± sexcostatus, costis locularibus late convexis vel obtuse carinatis, costis suturalibus angustis canaliculo tenui percursis in apicem crasse trialatum brevissime trigibbum desinentibus, glaber, sub lente minute rugulosus et velut pruina pallide brunnescente obductus, calyce vix aucto circa basin persistente.—*Folia* usque 29 cm. longa. *Bracteae* usque 6–7 mm. longae, oblongae, ± cucullatae vel cymbiformes.

AETOXYLON, GEN. NOV.

When proposing the Section *Aëtoxylon* for *Gonystylus sympetala* van Steenis et Domke, in *Kew Bull.* **1947,** 10, I had seen no material of this interesting plant, but realised from the original description that it must be a remarkably distinct species. Having now been able to examine material from the Forest Research Institute, Kepong, including a duplicate of the type (see Plates 5 and 6), I have no hesitation in raising the section to generic rank. It is almost as distinct from *Gonystylus* as is

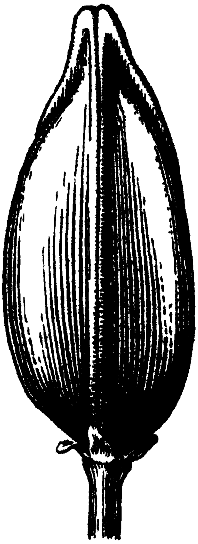


Fig 1 *Gonystylus augescens* Ridl Fruit, perhaps 3/4 grown. (Nat size)

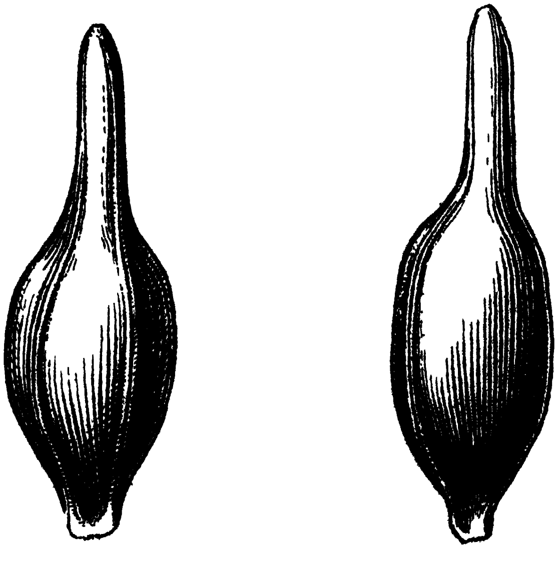


Fig. 2. *Amyxa pluricornis* (Radlk.) Domke.
Fruits, perhaps 3/4 grown : left with 4 ridges ; right with three ridges. (Nat. size).

Amyxa [van Tiegh.] Domke. The texture and venation of the leaves, the opposite or subopposite arrangement of the leaves and branchlets, the umbellate inflorescence, the annuliform corolla, and the rather small, irregular, verruculose, velutinous fruit, are widely different from the conditions found in either of the other genera.

Aëtoxylon (*Airy Shaw*) *Airy Shaw*, gen. nov. (Thymelaeaceae–Gonystyloïdeae), a *Gonystylo* Teijsm. et Binnend. ramulis foliisque oppositis vel suboppositis, nervatione laxo et saepe obscuro, unde folia subtus laevia et sublucida, floribus umbellato-congestis, sepalis reduplicato-valvatis, corolla ad annulum membranaceum humillimum redacta, fructu (immaturo) saepe irregulari verruculoso breviter velutino differt.—*Gonystylus* Sect. *Aëtoxylon* Airy Shaw in *Kew Bull.* **1947** (1), 10 (1947).

Calyx cupularis, ultra medium 5-lobus, lobis suberectis oblongo-triangularibus obtusis. *Corolla* ad annulum membranaceum erectum humillimum integerrimum glabrum redacta. *Torus* more *Gonystyli* setulis erectis flavidis dense vestitus. *Stamina* 10–14, brevissima, antheris hippocrepidiformibus. *Ovarium* subglobosum, dense pubescens, 4-loculare (an semper ?) ; stylus filiformis, elongatus, inferne sparse pilosus, stigmate capitato. *Fructus* (immaturus tantum notus) loculis saepe abortis irregulariter subglobosus vel subpyriformis, verruculosus, breviter velutinus. *Semina* nondum examinata.

Arbor alta. *Rami* teretes, longitudinaliter striatuli, cortice fusco; ramuli oppositi vel suboppositi saepe angulo fere recto divaricati, novellis velutinis. *Folia* opposita vel subopposita, petiolata, coriacea, elliptica vel saepe leviter obovata, penninervia, nervatione laxa supra immersa et inconspicua. *Inflorescentia* ex umbellis longipedunculatis subracemose dispositis sistens, umbellis usque 6-floris, pedunculis rectis sulcatis apicem versus nodoso-incrassatis.

Species adhuc unica, Borneonis occidentalis incola.

Aëtoxylon sympetalum (*van Steenis et Domke*) *Airy Shaw*, comb. nov. *Gonystylus sympetala* van Steenis et Domke in *Notizbl. Bot. Gart. Berlin*, **12,** 233 (1934), et apud Domke in *Biblioth. Bot.* **27,** Heft 111, 7, 33, 145, t. I, fig. 3 (1934) ; Airy Shaw in *Kew Bull.* **1947** (1), 10 (1947).

Sarawak. Stapok Forest Reserve, 'munggu,' fr. 28 March 1941, *Egon* A. 0901 : "Tree, 60 ft. high, 30 in. girth. Fruit red. Bark dark". Vernacular name : *ramin batu.*

Western Dutch Borneo. Sanggau : Kampoeng Mawa (Ginis), ± 100 m. alt., old forest, flat land, sandy soil, 23 Dec. 1932, *Soelaiman* 9 (bb. 17222) (type) : "Tree, 27 m. high, 40 cm. girth. Scarce. Flower buds green, odour unpleasant, taste moderate. An oil is obtained from the heartwood (*minjak garoe-laka*)." Vernacular name : *kajoe laka* or *garoe laka.* Sambas, n.d., *van den Hout* s.n. (fr. ; not seen ; *ex* van Steenis et Domke). Sine loc., 4 June 1932, *Schuitemaker* W.B. 176 (bb. 16703) ; vernacular name, *melebajan.*—Also probably (*teste* v. St. et Domke) : Palo, 26 July 1920, *Becking* 16 (bb....... ?).

AMYXA

Amyxa pluricornis (Radlk.) Domke.—Vide *Hook. Ic. Pl.* **35,** t. 3475 (1947).

Additional material seen :

SARAWAK. Tebon, Sadong, hilly ground, 24 April 1927, *Daud* A. 0039 (fl. ; Kepong) : " Tree 20 ft. high, 18 in. girth. Wood used for planks". Vernacular name, *ramin bukit* [=hill *ramin*]. Nanga Pelagos, 25 July 1938, *Daud & Tachun* 35650 (fr. ; Singap.) : " 20 ft. tall. Fruit yellow-green ". Gunong Gading, 8 Sept. 1938, *Daud & Tachun* 36092 (fl. ; Singap.) : " 50 ft. tall. Flower yellow ". Vernacular name, *ramin batu* [stony *ramin*]. Ibid., hilly ground, 8 Sept. 1938, *Egon* 0652 (fl. ; Kepong) : " Large, 50 ft. high, 3 ft. girth ; flower red ; bark red ; used for planks". Vernacular name, *ramin batu.*

It was satisfactory to find, on the two sheets of *Daud & Tachun* 35650 in Herb. Singapore, fruiting material of this apparently rarely fruiting species. It is possible that these fruits are not quite mature, but they cannot be far short of it, and their shape, as may be seen from the drawing (fig. 2), is very remarkable. A description follows.

Fructus breviter subcompresse ellipsoïdeo-oblongus, breviter stipitatus et longe rostratus, 5·8–6·8 cm. longus, rostro excluso 4–4·5 cm. longus, 2 cm. latus, 1 cm. crassus, rostro cylindrico 2–2·5 cm. longo 5–6 mm. diametro, sulcis (? 2–) 3–4 longitudinalibus marginibus elevatis paria costarum tenuium contiguarum efformantibus percursus, totus brevissime brunneo-velutinus, basi calycis segmentis persistentibus immutatis reflexis vel patentibus ornatus, pedicello incrassato.

All the above material is referable to the first of the two groups referred to in *Hook. Ic. Pl.*, l.c.—i.e. to the ' typical ' form. The localities all lie in the Kuching (First Division) area of south-western Sarawak. In the light of recent experience with specific distinctions in *Gonystylus*, I have now little doubt that the form represented by the second group there mentioned, comprising the *Clemens* specimen from Sungei Çaat, Central Sarwak (Third Division), and the *Richards* specimen from Mount Dulit (Fourth Division), further north, represents a distinct species. The differences between these groups are quite of the same order as those found in *Gonystylus*, and I therefore subjoin a formal description of this second species of *Amyxa*.

Amyxa taeniocera *Airy Shaw*, sp. nov., ab arcte affini *A. pluricorni* (Radlk.) Domke pube undique brevissima adpressa minute sericea nec patule tomentella, foliorum costa supra plana vel vix impressa, inflorescentiis ut videtur magis elongatis, petalorum setulis omnibus retrorsis adpressis, ' parastylis ' applanatis loriformibus erectis satis distincta.—*A. pluricornis* (Radlk.) Domke sec. Airy Shaw in *Bull. Misc. Inf.*, Kew, **1940** (6), 261 (1940) et in *Hook. Ic. Plant.* **35,** sub t. 3475 (1947), quoad *Clemens* 21687 et *Richards* 1604, non (Radlk.) Domke ; *Hook. Ic. Plant.* t. 3475, figs. 4a et 8a !

Arbor 15 m. alta (teste *Clemens*), c. 30 cm. diametro (teste *Richards*). *Ramuli* graciles, teretes, glabri, novellis minute adpresso-sericeis. *Folia* late oblongo-elliptica vel elliptica, 12–16 cm. longa, 4·5–6·5 cm. lata, basi subrotundata et in petiolum subabrupte breviter angustata, apice breviter acuminata, tenuiter chartacea, glaberrima (nisi costa subtus interdum parcissime puberula), siccitate ± pallide brunnea vel juniora viridula, utrinque minutissime, subtus dense et supra densissime, punctata ; costa subtus prominens, supra plana vel vix impressa ; nervi laterales gracillimi, 8–10-jugi, patuli, procurvi, marginem versus reticulatim anastomosantes, subtus prominuli, supra inconspicui ; venuli minores e costa magis patentim orti ; petioli graciles, 10–13 mm. longi, rugulosi, minute puberuli. *Inflorescentiae* elongate laxe thyrsoïdeae, usque 27 cm. longae, graciles, minute adpresse sericeae, ramis late patentibus usque 5 cm. longis, rhachi et ramis varie complanatis vel angulatis, bracteis linearibus usque 8 mm. longis adpressis, pedicellis 6–9 mm. longis sericeis. *Flores* iis *A. pluricornis* simillimi, sed petalorum setulae omnes adpresso-deflexae (nec superne patentes) et ovarii 'parastyli' applanati, taeniiformes, erecti. *Fructus* ignotus.

SARAWAK. Sungei Gaat, Upper Rejang River, forest slopes, 1929, *J. & M. S. Clemens* 21687 : "Tree, 50 ft. ; fl. green-yellow". Near Long Kapa, Mount Dulit (Ulu Tinjar), primary forest on hillside, under 300 m., 3 Sept. 1932, *Richards* 1604 (typus, Herb. Kew.) : "Tree, c. 30 cm. diam. Fls. greenish-white, sweet scented. Vernacular name, *soma merah*" [=red *soma*).

FURTHER NOTES ON WEST AFRICAN ANCISTROCLADUS

H. K. AIRY SHAW.

Dr. J. Léonard, of Brussels, has kindly drawn my attention to an unfortunate error in my note on "*Ancistrocladus barteri*" in *Kew Bull.* **1949** (1), 67 (1949), in which I stated that this name was first published by van Tieghem in 1903. This was quite erroneous : as Dr. Léonard points out, it was first published, with a proper Latin description, by G. F. Scott Elliot, in a paper "On the Botanical Results of the Sierra Leone Boundary Commission", in *Journ. Linn. Soc.*, Bot., **30**, 73 (1894), which I had entirely overlooked. Of this work van Tieghem seems also to have been unaware, when publishing his species, nor is any reference to it made in the *Flora of West Tropical Africa* ; and my failure to take account of it was due to this fact. (See also Léonard in *Bull. Soc. Roy. Bot. Belg.* **82**, 29 : 1949.)

Scott Elliot cited under *Ancistrocladus barteri* two of his own Sierra Leone specimens, nos. 4860 and 4797, which clearly formed the main basis of his description ; and, as a kind of afterthought, "also" *Barter* 1699, from Southern Nigeria. He gave no indication of type, nor any formal statement of the differences from *A. guineënsis* Oliv. *Scott Eliot* 4860 is one of the specimens referred in my paper to the "Sierra Leone race" of *A. guineënsis*, while *Scott Elliot* 4797 is referred to *A. abbreviatus* A. S. In his description of *A. barteri*, however, Elliot mentions a significant point of distinction between *A. barteri* and *A. guineënsis*, which I had altogether missed. He writes : "foliis . . . ad basin angustatis, margine valde revoluto (haud more *A. guineënsis* involuto)". This appears to be a good character, and sharply separates the Sierra Leone "guineensis" from the true *guineënsis* of S. Nigeria. Scott Elliot's description of the inflorescence of *A. barteri* as "Paniculi dichotomi 18 cm. longi et 12 cm. lati" is also clearly based on his (flowering) specimen no. 4860 (" guineensis "), not on his no. 4797 (*abbreviatus*). His description of the fruit, " obpyramidale 5-angulare, costis incrassatis, sine calycis lobis 15 mm. long. et 15 mm. lat.", is, however, based on the fruiting specimen of *A. abbreviatus*, no. 4797. (The fruit of *A. abbreviatus* is figured in Hutch. et Dalz., *Fl. W. Trop. Afr.* **1** (1), 196, fig. 86 D : 1927.)

Taking all the circumstances into consideration, it will probably be best to select *Scott Elliot* 4860 as the lectotype of *A. barteri* Scott Elliot (non van Tiegh.). This will enable this name to stand for the Sierra Leone plant, which is closely related to *A. guineënsis* but is apparently a distinct species, distinguished by the revolute, not involute, leaf-margin, and certain less easily defined characters of venation and inflorescence (cf. p. 69, *supra*). *A. guineënsis* is thereby restricted to Nigeria. *A. barteri* van Tiegh. (non Scott Elliot), being based exclusively on the sterile *Barter* 1699 from Onitsha, S. Nigeria, remains problematic, for the leaf-margins are, as noted by Elliot, *re*volute as in the Sierra Leone plant, not *in*volute as in the remaining Nigerian material. It is very probable that it represents a sixth West African species, since Dr. Léonard has lately described* three new species from the Belgian Congo. A recent collection (*Jones* [F. H. I.] 621) from Onitsha, almost certainly conspecific with Barter's, appears to indicate a species related to *A. likoko* Léonard (*l.c.* 34, t. 1, H-J).

Revised citations for *A. barteri* are given below.

Ancistrocladus barteri Scott Elliot in *Journ. Linn. Soc., Bot.*, **30,** 73 (1894), pro parte ; excl. *Scott Elliot* 4797 et descr. fruct. ; Hutch. et Dalz., *Fl. W. Trop. Afr.* **1** (1), 196 (1927), pro parte.

? *A. barteri* van Tiegh. in Morot, *Journ. de Bot.* **17,** 154 (1903), *nom. provis.*

? *Ancistrella barteri* van Tiegh. *l.c.* 155 (1903).

[*Ancistrocladus guineensis* Oliv. sec. Airy Shaw in *Kew Bull.* **1949** (1), 68 (1949), quoad specim. e Sierra Leonis, non Oliv.]

SIERRA LEONE. *Scott Elliot* 3841 (not mentioned by Elliot), 4860 (lectotypus !) ; *Deighton* 3815, 3885 (for details see *K.B.* **1949,** 69).

LIBERIA. Grand Cape Mount Co. : Génna Tanyehun, 21 Dec. 1947, *J. T. Baldwin Jr.* 10756 : " High climber (sterile) ".—Probably this : Central Prov., Sanokwele Distr. : Ganta, by St. John River, 1 Feb. 1948, *J. T. Baldwin Jr.* 11016 : " High climber ".

The following is a rough key to the known West African species of *Ancistrocladus* :

Inflorescence very short and congested, 1–2 cm. long ; fruit obconic, 1·5 cm. long, with short, thick, erect wings ; leaf-margin at base revolute (Sierra Leone, Liberia, Gold Coast) . . . .
A. abbreviatus Airy Shaw†

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*Une nouvelle et curieuse famille pour la flore phanérogamique de Congo Belge : les Ancistrocladaceae. *Bull. Soc. Roy. Bot. Belg.* **82** (1), 27–40 (1949).

†I take this opportunity of citing *Deighton* 2589, from Njala, Sierra Leone, as the type of *A. abbreviatus* ; this citation was inadvertently omitted in *K.B.* **1949** (1), 68 (1949).

Inflorescence loosely cymose, with elongate branches :

Leaves small, under 8 cm. long, abruptly contracted at base ; leaf-margin at base revolute ; fruit unknown (S. Nigeria) . . . . **A. uncinatus** Hutch. et Dalz.

Leaves large, over 10 cm. long, gradually narrowed to base :

Leaf-margin at base involute ; venation less strongly reticulate ; fruit subglobose, under 1 cm. long, with 3 long and 2 shorter thin spreading wings (S. Nigeria) . . . **A. guineënsis** Oliv.

Leaf-margin at base revolute ; venation more strongly reticulate ; fruit unknown :

Leaves contracted at base into narrow " pseudo-petiole " ; venation very lax, nerves about 7–8 pairs ; intramarginal nerve none ; inflorescence-branches relatively short and slender, flowers small, crowded towards the tips (Sierra Leone, Liberia) . . . . **A. barteri** Scott Elliot

Leaves uniformly narrowed to base, without " pseudo-petiole "; venation crowded, nerves about 20 pairs ; intramarginal nerve distinct ; inflorescence-branches very long and rather thick, flowers relatively large, arranged rather distantly along most of length of branches (Liberia) . . . . . . **A. pachyrrhachis** Airy Shaw (*infra*)

Ancistrocladus pachyrrhachis *Airy Shaw*, sp. nov., *A. barteri* Scott Elliot affinis, sed foliis basi minus abrupte angustatis (i.e. vix 'petiolatis') nervis crebrioribus plus duplo numerosioribus, nervo intramarginali distincto, inflorescentiis majoribus basi plerumque foliis specialibus redactis comitatis, rhachibus elongatis saepe bis terve tantum furcatis vel etiam simplicibus crassiusculis subteretibus dissitifloris, floribus plus duplo majoribus bene distincta.

Frutex alte scandens, caulibus teretibus, cortice laevi brunneo interdum leviter cinereo-pruinoso tandem longitudinaliter striato-fisso, uncis plerumque infra inflorescentias sitis. *Folia* oblanceolata, 10–25 cm. longa, 3–7 cm. lata, basi cuneato-angustata 5–6 mm. lata vix ' pseudo-petiolum ' brevissimum efformantia, apice subobtusa vel brevissime acutata, margine anguste reflexa, chartaceo-coriacea, glabra, siccitate brunnescentia, costa subtus tereti valde prominente supra levissime impressa, nervis lateralibus primariis gracilibus patulis subrectis valde numerosis (20–25-jugis in folio maximo), plerumque cum nervis minoribus secundariis parallelis alternantibus, 3–4 mm. a margine in nervum intramarginalem conspicue anastomosantibus, rete nervorum ceterum ei *A. barteri* Scott Elliot simili. *Inflorescentia* ampla, 15–35 cm. longa, ramis primariis 3–5, his plerumque bis terve furcatis interdum simplicibus, ramulis elongatis fere per totam longitudinem remotiuscule floriferis floribus 1–1·5 cm. inter sese distantibus pedicellis persistentibus conspicuis, rhachibus teretibus crassiusculis (fere per totam longitudinem 1–1·5 mm. crassis apicem versus parum vel vix attenuatis) ; inflorescentia basi foliis parvis specialibus (vel bracteis) 3–10 oblanceolato-spatulatis 2–7 cm. longis comitata. *Flores* pro genere majusculi ; pedi-

celli 2–4 mm. longi, late patuli vel arcuato-patentes, rigidi, persistentes, apice articulati conspicue discoideo-expansi; alabastra globoso-pyriformia, sub anthesin 6–7 mm. longa. *Sepala* inaequalia, 2 exteriora latissime obovata fere orbicularia circiter 5–6 mm. longa, 2 interiora late elliptico-obovata 6–7 mm. longa, quintum situ et forma intermedium, omnia apice rotundata, basi plus minus inter se et cum ovario coalita et valde imbricata et in stipitem brevem cuneato-angustata, crassiuscula, rigida, dorso more generis glandulis foveiformibus paucis conspicue notata. *Petala* alabastro obovata, sed anthesi ineunte elongantia, elliptico-oblonga, 8–9 mm. longa, 3–3·5 mm. lata, apice rotundata, reflexo-patentia. *Stamina* 10, per paria petalis opposita iisque basi adnata, 5–6 mm. longa, basi incrassata, superne attenuata, antheris parvis ovatis vix 1 mm. longis. *Styli* 3, teretes, 4–4·5 mm. longi, valde caduci, in mamma humili depresso-conica insidentes, stigmatibus parvis capitatis. *Fructus* ignotus.

LIBERIA. Montserrado Co.: Monrovia, sandy area, 30 May 1947 and 7 Jan. 1948, *J. T. Baldwin Jr.* 5839 (typus, Herb. Kew.) and 10984 (both from same plant): " Scandent shrub, about 10 feet high ".

This appears quite distinct from the four West African species so far known. It is nearest to *A. barteri* Scott Elliot, but the close venation, distinct intramarginal nerve, less abruptly attenuate leaf-base, elongate comparatively thick inflorescence-branches and larger distantly arranged flowers immediately separate it. It is remarkable that this plant from the well-collected neighbourhood of Monrovia should have hitherto escaped detection. Mr. Baldwin now writes (10 Sept. 1949) that this particular specimen has unfortunately almost certainly " been cut either for firewood or because it was on a prospective house site. I have searched for the plant several times. It grew in a sandy area within the limits of Monrovia . . . In my walkings throughout this country I never saw a second plant ". It is evidently an extremely local species.

Drawings of British Plants.*—Three parts of this work have now been published. The first part, devoted to *Ranunculaceae*, contains 44 plates, while the second, dealing with *Berberidaceae*, *Nymphaeaceae*, *Papaveraceae* and *Fumariaceae* has 22. In the third part, which has recently appeared, the author has depicted the British representatives of *Cruciferae* in 77 excellent drawings which maintain the high standard usually associated with Miss Ross-Craig's work. As in the previous numbers, the various parts of each plant are clearly and accurately shown and the numerous enlarged figures of floral and vegetative details (the scale being indicated against each) will be found particularly useful when dealing with this difficult group of plants. Each plate is accompanied by a full explanatory legend including the common name and colour of the flowers. It is evident that this work, which commences a series of uniform and critical botanical drawings long needed by the keen student of the British flora, has been carefully prepared and well-produced, and reflects great credit on artist, block makers and publishers alike.

H.S.M.

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*Part I. *Ranunculaceae* (44 plates), 1948. Price 6/-. Part II. Berberidaceae, *Nymphaeaceae*, *Papaveraceae*, *Fumariaceae* (22 plates). 1948. Price 4/6. Part III *Cruciferae* (77 plates). 1949. Price 9/-. London: G. Bell & Sons, Ltd.

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CLASSIFICATION OF THE BANANAS.

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III. Critical Notes on Species.

r. **Musa borneensis** *Beccari*, Nelle Foreste di Borneo, 622 (1902).

The original description, with the Italian notes translated, runs :

Truncus cylindricus, stoloniferus (?) ; petiolus longiusculus ad basin dilatatus ibique ad margines undulatus et crispatus ; inflorescentia pendula ; bracteae late-ovatae, obtusae, flores 5–8 uniseriates obtegentes ; flores masculi 7 cent. longi, in apicem 3-dentatum regulariter attenuati, lobis lateralibus tenuissime cuspidatis, tepalum liberum (floris ♂) perigonio 1/4 brevius, angustum, acutum, leviter ventricosum, marginibus membranaceis involutis ; bacca majuscula, incurva, subcylindrica vel obtusissime costulata, basi breviter crasseque stipitata, apice abrupte, late, breviter obtuseque apiculata ; semina majuscula, obpyriformia, in dimidia superiore parte scabrido tuberculata.

Habitat Sarawak at Marop (P.B. n. 3356).

Plant similar in appearance and size to a common banana. Leaf-stalks arcuate-spreading ; margins of the sheaths glabrous, auriculate, clasping and corrugate. Bunch large, unilateral, pendent. Male flowers uniseriate, 5–8 to each bract, white, greenish at the tip ; bracts rose-vinous, reflexed, revolute at the apex. Perigonium (closed), two-keeled, open above, semi-clasping ; compound tepal provided at the tip with three spreading teeth, later reflexed, green, triangular, the middle one obtuse, the lateral ones terminated by a long filiform point ; free tepal cymbiform, slightly inflated, acute at the apex ; stamens included in the perigonium ; pollen extruded unitedly in a viscosity at the mouth of the perigonium. Fruit glabrous, uniseriate, 14–16 cm. long and 3·5 cm. thick ; seed obpyriform, rather large, about 1 cm. long and 7 mm. wide, tuberculate roughish in the upper half.

This description is illustrated by a photograph of the fruit and a line drawing of the male flowers.

We received seeds at I.C.T.A. in 1931 (Introduction no. 118) from the Director of Agriculture, Sarawak, with the label " Pisang Kra ", from which we succeeded in raising a single plant which is somewhat delicate under our conditions but has been kept alive as a clone and flowered several times. This plant fits Beccari's commendably detailed description and figures so closely that I have no hesitation in identifying it as *M. borneensis*, though it is not often that a *Musa* can be confidently determined from description alone.

Our observations permit the addition of some details to the description : The plant is stoloniferous, though stooling rather sparsely under our conditions. Its pseudostems reach about 3 m. in height and 15–20 cm. in diameter at the base, and are green with a purplish flush and blackish-purple markings, quite devoid of wax. Leaf-blades are 2–2·5 m. long, 60–65 cm. wide (all dimensions are probably bigger in Sarawak as our plant is checked annually by the dry season) on petioles about 60 cm. long. The broad corrugated auricles at the region where the petiole joins the sheath are conspicuous and characteristic.

The female flowers (5–8 per bract in a single row) have a compound tepal 6–7 cm. long, with two prominent thickened keels and hyaline margins, its lobes are small (2–3 mm.) and the accessory teeth minute. The free tepal is 4·5–5 cm. long and the staminodes are about 1 cm. long.

The male bud in advanced blooming is very broadly ovate, with the bracts strongly imbricate. The bracts, described by Beccari as " rosy-vinous ", are indeed a very handsome crimson-purple, green at the extreme tip, broadly ovate and blunt, shining with a polished appearance and stiff in texture. There is nothing unusual about the dehiscence of the anthers and extrusion of the pollen.

The seeds of our plant are a trifle smaller than Beccari's, 7 mm. long and 5 mm. wide, but otherwise answer excellently to his description, having a distinct waist at the middle (marking the base of the perisperm chamber within) and being rugose-tuberculate above this line and smooth below.

On this characteristic seed shape the species is referable to my section *Callimusa*, and it has the chromosome number of that section ($n = 10$) (count recorded in J. Genetics **30** : 16 (1935) as " *Musa* sp. undet. from Sarawak ", where it is erroneously classified under §*Rhodochlamys*). *M. borneensis* crosses with other species of §*Callimusa* and also with *M. textilis*. It is interesting as being the largest plant yet described in its section, and also as having one of the largest non-parthenocarpic fruits in the whole genus. I saw numerous plants of this species along the Simanggang Road, 26 miles from Kuching, in 1948.

CLASSIFICATION OF THE BANANAS.

E. E. Cheesman

Imperial College of Tropical Agriculture, Trinidad, B.W.I.

III. Critical Notes on Species.

s. **M. violascens** *Ridley* in Trans. Linn. Soc. Ser. 2, **3** : 384 (1893) and **M. gracilis** *Holttum*, sp. nov.

The first of these species is Introduction No. 108 in the I.C.T.A. collection and was received as seeds from Malaya in September 1931. The parent plants grew on the Government Experimental Plantation at Serdang, Selangor.

Plate 7.

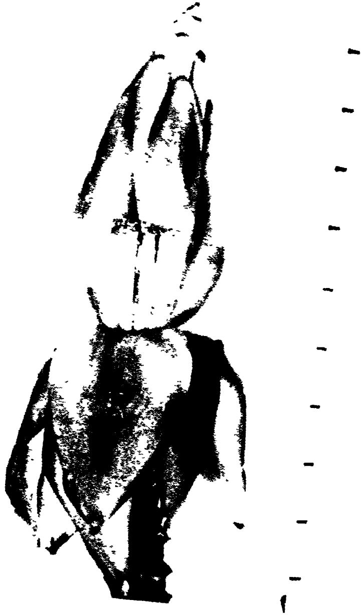

Fig. 1. Male bud in advanced blooming.

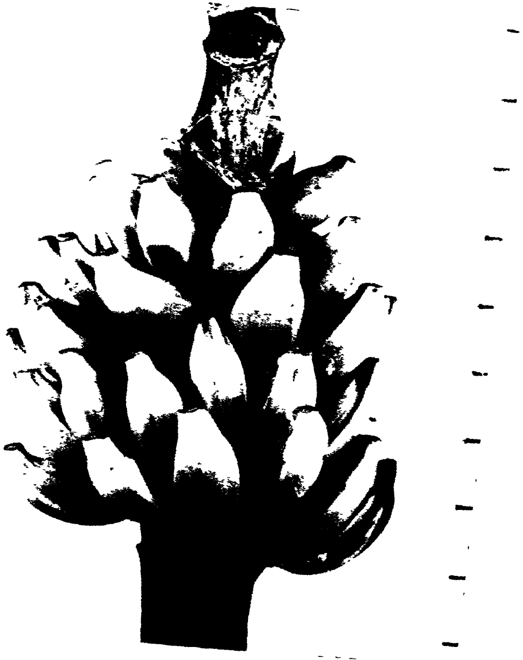

Fig. 2. Fruit bunch approaching maturity.

Scales in inches.

Musa violascens Ridley.

Photographs by K. S. Dodds.

The characters of I.R. 108 conform so badly to Ridley's descriptions of *M. violascens* (*loc. cit. et in* Fl. Malay Penins. 4, 295 : 1924) that for some time I thought it must be a distinct and undescribed species. For instance, Ridley says the flowers are few and arranged in single rows in each bract, whereas in our plant the bracts subtend about 10 flowers in two rows. He also says that " the petal has the form of that of the Eu-musa section ", but in our plant the free tepal (scarcely shorter than the compound) certainly has *not* such a form.

On a recent visit to Malaya (1947) I found that our I.R. 108 is truly representative of a species very common in many parts of the peninsula, and in discussion of its nomenclature with Mr. R. E. Holttum at the Singapore Botanic Garden was satisfied that it is correctly referred to *M. violascens* Ridley. Mr. Holttum had observed similar discrepancies between the original description and the type specimen at Singapore and found the common species to agree with the type. A description of the Trinidad material follows :

Plant stooling freely. Pseudostems slender, 1·2 metres high, green, devoid of any perceptible wax bloom. Leaf blades up to 2 m. long or longer, 50 cm. wide, shining above, dull beneath but not glaucous ; midribs green above, like the lamina, paler beneath; petioles 40–50 cm. long, with scarious margins, which are very slight above but broaden below and where the petiole passes into the leaf-sheath are expanded into conspicuous corrugate auricles.

Inflorescence erect, very shortly exserted above the uppermost leaf-sheath, so that the lowermost cluster of flowers very often does not get free ; peduncle about 3 cm. thick, shortly pubescent ; first sterile bract usually with a green lamina, this followed by a sterile true bract, white outside, light violet within; first fertile bract up to 20 cm. long, variegated white, pale violet and dark violet, the later ones gradually becoming darker, all with a green tip. Flowers of the basal bracts female, usually 4–8 " hands " of 8–10 flowers each, in two rows ; flowers of the upper bracts male.

Female flowers 8-9 cm. long overall ; ovary 3·5–4 cm. long, white, glabrous ; compound tepal 4·5 cm. long, white, its tip and lobes deep yellow, lateral lobes 0·5 cm. long with a dorsal filiform appendage of 3 mm. ; free tepal nearly 4 cm. long, 1·2 cm. wide, not boat-shaped or even very strongly concave, truncate at apex, not apiculate ; staminodes short, of various lengths, the longest about 1·5 cm.

Male bud in advanced blooming top-shaped, very acute, the bracts very strongly imbricate (outermost only about two-thirds the length of the bud). Bracts pale violet or mauve, often splashed with white or with darker violet, green at the extreme tip ; outer surface quite plane, shining with a polished appearance, inner surface duller but similar in colour to the outside., Bracts not revolute on fading but strongly reflexed against the rachis and tending to persist in the withered condition.

Male flowers about 10 to each bract in two rows (at least in the lower and middle bracts ; sometimes fewer and uniseriate in very old buds) ; compound tepal 4–5 cm. long, white at base, green towards the tip, with yellow lobes, outer lobes each with a filiform dorsal appendage 0·5 cm. long ; free tepal scarcely shorter than the compound tepal, white, narrow-oblong, blunt or truncate, with only an obsolete apicula.

Fruit bunch compact. Individual fruit 4–7 cm. long, about 2 cm. in diameter, oblong, rather distinctly angled at maturity, narrowed or rounded into a subsessile base, usually narrowed more gradually to the apex, obsoletely or distinctly but not abruptly acuminate, the tip broadly truncate ; pericarp about 1 mm. thick, blackening at full ripeness ; pulp scanty, cream-coloured.

Seeds numerous, cylindrical, 6 mm. long, 4 mm. in diameter, black, minutely tuberculate, the transverse line marking the perisperm chamber not conspicuous.

Some quantitative variation is to be expected between individuals and our Trinidad material, clonally propagated from a single seedling and grown under garden conditions, is not necessarily typical in its dimensions. Holttum's observations on wild plants and dried specimens are that the female flowers are 5–8 per bract and the fruits slightly larger than ours, 6–8 cm. or even up to 10 cm. long and 2·5-3 cm. in diameter. He also notes that on male flowers examined by him the filiform appendage of the lateral lobes was barely 1 mm. long. These, however, are unessential points casting no doubt on the specific identity of I.R. 108.

M. violascens is one of the two species of *Musa* very common in Malaya, the other being *M. acuminata*, and the two very often occur together. It has both the chromosome number (n = 10, recorded by Cheesman, J. Genetics, **30,** 46 : 1935) and the cylindrical seed characteristic of the section *Callimusa*.

M. campestris Beccari, Nelle Foreste di Borneo, 622 (1902) must from its description be a very similar plant, but differs in bract colour and in its inflorescence axis being glabrous at maturity of the fruit. *M. salaccensis* Zollinger, Syst. Verz. Ind. Archip. 74 (1854) of Java and Sumatra is also clearly allied but distinct.

Another species of the section *Callimusa* occurs in Malaya. It was first collected by Ridley and has now been named and described from more complete material by Holttum, who has very kindly supplied the following description and notes for publication in this place :

Musa gracilis *Holttum*, sp. nov.—Caudex (vaginis foliorum constructus) 60-200 cm. altus, basi c. 8 cm. crassus ; vaginae purpureo-suffusae ; lamina folii 90–150 cm. longa, 25-35 cm. lata (interdum minor), omnino pallide viridis ; petiolus 30-70 cm. longus. Inflorescentia erecta, 60 cm. vel ultra alta, rachis dense pilis brevibus patentibus vestita, interdum glabrescens ; flores feminei in fasciculis 3–8, 2·5–4 cm. dissitis, dispositi, in quoque fasciculo 2–4 flores ; bracteae infimae 15 cm. longae, 4·5 cm. latae, deciduae, violaceae, apice virides ; bracteae florum masculorum minores, mox deciduae ; tepalum compositum (floris masculi) 4 cm. longum, pallide viride, lobis lutescentibus, lobi exteriores appendiculis 3 mm. longis instructi ; tepalum liberum fere 4 cm. longum, oblongum, obtusum. Fructus fere erecti, c. 10 cm. longi, 2–2·5 cm. crassi, apice obtusi, non rostrati, valde 2-3 angulati, pallide virides vel glaucescentes interdum violaceo-striati ; stipites fructuum c. 2 cm. longi, in juventute hirsutae, glabrescentes.

TRENGGANU : Ulu Bendong, Kajang, Kemaman, 500 ft., in hillside forest by streams, *S.F.N.* 30056, leg. E. J. H. Corner, 30.10.1935 (TYPE).

JOHORE : G. Panti, west, by streams in Dryobalanops forest, S.F.N. 30959 (Corner) ; Sungei Pelepah, near G. Panti, 200 ft., S.N.F. 20011 (Md Nur) ; G. Pulai, *Ridley* 12146 ; Kukub, Tempayan River, *Ridley* 13276 ; Kluang-Mersing Road, 2nd mile, *S.F.N.* 9335 (Holttum) ; Labis, *S.F.N.* 38204 (Henderson).

MALACCA : Batang Malacca Road, *Derry* s.n., July 1892.

This species is distinct from *M. violascens* in its much smaller size, deciduous bracts and longer, proportionately more slender fruits, which are never more than 4 to a hand, in one row. Corner describes the fruits of the type specimen as " light greenish white ", Ridley those from the Tempayan river as glaucous, and those from G. Pulai as having " longitudinal violet bands ", Henderson those from Labis as " pale glaucous green ". The bracts are apparently sometimes almost white, but always with some suffusion of violet-purple.

This is the species described briefly but not named by Ridley in *Flora Mal. Penin.* 4 : 295. It is evidently not uncommon in Johore, and has been found as far north as Kemaman on the east coast, but not north of Malacca on the west.

Lilies of the World.—This was originally intended to be a third edition of *Woodcock and Coutts, Lilies, their Cultivation and Management* (see Kew Bull. 1935, p. 582), but in the course of revision " so much new matter had to be added, so much of the original book modified or deleted, that the work became essentially a new book " and it has therefore been published as such.* It follows the pattern of the earlier work and much of the text has been taken over unchanged, but considerable alterations and additions have been necessary to bring the work up to date, especially in view of the critical revision that has been made in the nomenclature. The chief innovation, and one which immensely enhances the value and usefulness of the work, is the provision of references to the literature of each species. Attention has also been paid to the " set-up " of the text, and the use of bold-face type for the names of the plants in the alphabetical list greatly facilitates reference. The additions and emendations are the work of Mr. W. T. Stearn. In the Preface Judge Woodcock explains that the deterioration in his own eyesight made the unaided preparation of the book impossible, and he therefore again enlisted the co-operation of Mr. Stearn, " who provided much valuable material for the former book and to whom practically the whole of the preparation of the present book must be ascribed." To those who know Mr. Stearn, this will be sufficient guarantee that the work has been well, carefully, and very thoroughly done. The book fully comes up to expectation, and is undoubtedly a decided improvement on its predecessor. The work is encyclopaedic in scope, and if all the available information about lilies is not actually set out within the 400 or so pages of this volume, a very full synopsis is provided, and the references to literature given throughout, together with the excellent bibliography at the end, will enable the reader to fill the gaps.

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*Lilies of the World. Their Cultivation and Classification. By H. B. Drysdale Woodcock and William T. Stearn. pp. 431, 96 photographs, and 41 line drawings. London, Country Life Limited. 1950. Price 35/- net.

Like the earlier work, this book is divided in two Parts. Part I opens with a pleasant Introduction, followed by a chapter on the structure of lilies and the functions of their various parts, designed to help the amateur to understand the biological characteristics of the plants. The rest of this Part (some 66 pages) is devoted to cultivation, and its scope is shown by the chapter-headings, *viz.* : Climate Position and Soils, Easy and Difficult Lilies, Their Place in the Garden, General Cultivation, Lilies in Pots and in the Greenhouse, Propagation, Hybridization, and Enemies of the Lily. Part II starts with a brief account of the classification of *Lilium* and a note on its related genera. This is followed by a short chapter on geographical distribution, and then comes the main part of the book, some 240 pages devoted to the species and hybrids of Lilium (arranged alphabetically) and the species of the closely related genera, *Cardiocrinum, Notholirion* and *Korolkowia.* For good measure there are six appendices dealing respectively with The Genus Nomocharis, Latin Diagnoses (for a few names not hitherto validly published), Subdivisions of Lilium, Bibliography, Storage and Packing of Lily Bulbs, and short Glossary of Technical Terms. There is an excellent Index, and, finally, the whole work is enriched by some 137 well-chosen illustrations which include at least one picture of every species of *Lilium* enumerated.

The text presents a great deal of accurate information in a very readable form, and it is not too much to say that this book will prove invaluable to all interested in lilies and their allies—to the experienced professional botanist as much as to the veriest amateur gardener. It has but one defect : there is no key to the species of *Lilium.* The reason for this omission is not hard to guess, for *Lilium* is a genus where differences are often of the subtle kind not easily set out in words, and the difficulty in providing a key that would be workable for any but the experts is formidable indeed. A difficult key might well be a source of error instead of a means of identification, and in a book like this, which is designed for the beginner as much as for the expert, the authors are probably wise to omit the key altogether. The book is well-printed and forms a neat and handsome volume. The authors must be congratulated on an excellent and scholarly work.

J. ROBERT SEALY.

Horticultural Abstracts*.—The appearance of a five year index to Horticultural Abstracts, covering volumes XI–XV will be welcomed by all who consult this useful publication. The index is well arranged and includes a subject analysis of abstracts, a full and comprehensive subject index, alphabetically arranged with useful cross references, followed by an index of authors. The value of Horticultural Abstracts will be greatly enhanced by the provision of such a carefully prepared and exhaustive index.

H.S.M.

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*Index to Horticultural Abstracts. Volumes XI-XV. 1941-1945 (1949). Compiled by D. Akenhead. Commonwealth Bureau of Horticulture and Plantation Crops ; East Malling, Kent : Commonwealth Agricultural Bureau, Central Sales Branch, Penglais, Aberystwyth. Price 35/-.

NOTES ON AFRICAN MARANTACEAE : I

E. MILNE-REDHEAD.

TRACHYPHRYNIUM AS RECOGNIZED BY K. SCHUMANN.

When Bentham (1883) described the genus *Trachyphrynium* he did not cite any type species for his generic name. He states that the genus contained 4 or 5 species from tropical West Africa of which one also had been collected in Niamniam-land by Schweinfurth under his number 3061. At this time none of the species included by Bentham in *Trachyphrynium* had been described. His generic description is based, so far as the fruit is concerned, on the species represented by the Schweinfurth gathering mentioned above, as that is the only known species with a dehiscent fruit and arillate seed.

In dealing with the *Marantaceae* from Tropical Africa in the Berlin Herbarium, K. Schumann (1892) divided Bentham's genus into two parts. The lesser part, consisting of a single species, he placed in a new genus, *Hybophrynium*, as a new species, *H. braunianum* K. Schum. ,whilst the greater part, consisting of four species, he retained in *Trachyphrynium*. Schumann distinguished his *Hybophrynium* from *Trachyphrynium* principally on account of its having dehiscent fruits and arillate seeds. There would appear to be no satisfactory diagnostic character in the flowers of these two genera as defined by Schumann.

Now it so happens that the only specimen cited by Bentham, namely Schweinfurth 3061, is the species which Schumann called *Hybophrynium braunianum*. In view of this and the fact that Bentham drew the more important part of his description from the fruits and seeds of this species, one is bound to consider it the type species of the generic name *Trachyphrynium*. That being so, it is necessary to decide what to call the other species placed in *Trachyphrynium* by Schumann and others.

In his account of the *Marantaceae* in Engler's Pflanzenreich, Schumann (1902) recognised five species of *Trachyphrynium*. He distinguished the genus from his *Hybophrynium* on the fruits being indehiscent and the seeds exarillate. He divides it into two subgenera, *Lasiodelphys* K. Schum. containing *T. danckelmanianum* J. Braun et K. Schum. and *T. liebrechtsianum* De Wild. et Th. Dur. on the one hand and *Hypselodelphys* containing *T. violaceum* Ridl., *T. poggeanum* K. Schum., and *T. zenkerianum* K. Schum. on the other.

Subgenus *Lasiodelphys* K. Schum. was characterised by Schumann as having a strongly circinnate inflorescence, bracts which are strongly folded, suborbicular, persistent and which separate from each other before flowering, pairs of flowers arranged in twos and a villous ovary. He described subgenus *Hypselodelphys* K. Schum. as having the inflorescence less markedly or not at all circinnate, the bracts convolute, oblong, caducous and densely imbricate before flowering, the pairs of flowers solitary, and a glabrous muriculate ovary. He does not mention the fruits in his diagnosis of subgenus *Lasiodelphys* whilst the muricate nature of the fruits of the three species of subgenus *Hypselodelphys* is not mentioned in the diagnostic key, as he considered this character to be generic.

The reason for this omission is not far to seek. Schumann figures, as the fruit of *T. danckelmanianum*, a fruit which almost certainly does not belong to that species, and which in my opinion is that of *T. poggeanum*, whilst, at that time, the fruit of *T. liebrechtsianum* was unknown. Schumann therefore believed that the fruits of all the species were essentially of the same nature, namely muricate. He did not realise that only those plants which had the muriculate ovary could produce a muricate fruit!

Léonard (1949), who was familiar with the Congo species of *Marantaceae*, both in the field and in the herbarium, had noticed that the fruit of *T. liebrechtsianum* were not muricate and did not conform with those of the genus *Trachyphrynium*, as recognized by Schumann, whilst the perispermatic canal was of a different shape. He therefore described a new genus for *T. liebrechtsianum*, for which he proposed the name *Haumania* J. Léonard. Working quite independently, I had come to the same conclusion. Aided by the presence of a number of gatherings of the Cameroons species, *T. danckelmanianum*, in the Kew Herbarium, including a few on loan from Brussels, I considered that *T. liebrechtsianum* and *T. danckelmanianum* were undoubtedly congeneric*, and that Schumann's subgenus *Lasiodelphys* required raising to generic rank. Apart from the fruit and seed characters mentioned by Léonard, and the diagnostic characters for subgenus *Lasiodelphys* given by Schumann, there are some fundamental differences in the structure of the inflorescence which add strength to this view. Most striking of these is perhaps the absence of the small, thickened, subglandular, almost horny bracteoles used by Schumann (1902) to separate a number of genera in his *conspectus generum* on page 30. These bracteoles are present in subgenus *Hypselodelphys* and in *Trachyphrynium* Benth. (*Hybophrynium*, K. Schum.).

We have therefore a name for one part of Schumann's genus *Trachyphrynium*, namely *Haumania* J. Léonard. It is here proposed to use Schumann's subgeneric name for the other part of his *Trachyphrynium*, calling the genus *Hypselodelphys* (K. Schum.) Milne-Redhead.

KEY TO DISTINGUISH *TRACHYPHRYNIUM* BENTH. FROM THE GENERA WITH WHICH IT HAS BEEN CONFUSED.

1. Bracts oblong-lanceolate, convolute, never spreading, caducous after flowering time; each pair of flowers provided with two short horny bracteoles ; ovary glabrous, densely muriculate ; fruit strongly and densely muricate **2**

Bracts suborbicular, strongly folded not convolute, spreading in anthesis and persisting after the flowers have fallen ; each pair of flowers enclosed within a large 2-keeled bracteole ; ovary densely hairy ; fruit irregularly warty-rugose with a few persisting hairs . . 3. *Haumania*

2. Fruits dehiscent ; seeds with a large aril . . 1. *Trachyphrynium*

Fruits indehiscent ; seeds without an aril . . 2. *Hypselodelphys*

Hypselodelphys (*K. Schum.*) *Milne-Redhead*, genus nova.

[*Trachyphrynium* Benth. in Benth. et Hook. f., Gen. Pl. **3**, 651 (1883), pro parte, excl. sp. capsulis dehiscentibus.]

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*De Wilderman & Th. Durand (1900) had stressed the close relationship of these two species.

[*Trachyphrynium* (non Benth.).—K. Schum. in Engl., Bot. Jahrb. **15,** 432 (1892) et in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. **2,** 94 (1897), pro parte, excl. *T. danckelmanianum* J. Braun et K. Schum.]

[*Trachyphrynium* (non Benth.).—Bak. in Dyer, Fl. Trop. Afr. **7,** 318 (1898), pro parte, excl. *T. danckelmanianum* J. Braun et K. Schum. et *T. braunianum* (K. Schum.) Bak.]

[*Trachyphrynium* (non Benth.).—K. Schum. in Engl., Pflanzenr. IV, **48,** 42 (1902), pro parte, quoad subgenus *Hyselodelphys* K. Schum.]

[*Trachyphrynium* (non Benth.).—Lemée, Dict. Gen. Phan. **6,** 643 (1935), pro parte, excl. spec. ovariis velutinis.]

[*Trachyphrynium* (non Benth.).—Hutch. in Hutch. & Dalz. Fl. W. Trop. Afr. **2,** 337 (1936), pro parte, excl. *T. danckelmanianum* J. Braun et K. Schum.]

Plantae subscandentes culmis graciliter bambusiformibus demum superne ramosis foliosis instructae. *Folia* brevipetiolata ; lamina oblonga elliptica vel ovata, acuminata, asymmetrica, antitropa ; petiolus inferne ± longe vaginans, inde in partem plerumque brevissimam teretem continuo desinens, demum apice in partem teretem quasi pulviniformem articulo conspicuo sejunctam abiens, parte pulviniformi apice sub ipsam laminam conspicue truncato quasi pseudo-articulo a costa abrupte sejuncta. *Cymae* compositae in spicam simplicem vel ramosam ± cincinnatam dispositae. *Bracteae* abaxillae ante anthesin arcte imbricatae, convolutae, alabastra et cymas superiores includentes, caducae ; bracteae adaxillae paria florum solitaria includentes, caducae ; flores in pedunculo gemini, uterque bracteola adossata munitus. *Sepala* 3, libera, leviter inaequales. *Petala* 3, unguibus in tubum conniventibus ; laminae reflexae, extus saepe strigulosae. *Staminodia* exteriora petaloidea ; staminoidium interius cucullatum, longe calcaratum. *Anthera* monotheca. *Ovarium* dense muriculatum, triloculare loculis uniovulatis ; ovulum a basi erectum ; stylus inclusus, basi tubo stamineo adnatus, crassiusculus, apice incurvus ; stigma obliquum leviter concavum. *Fructus* tricoccus, indehiscens, dense muricatus. *Semina* exarillata.

KEY TO THE SPECIES OF *HYPSELODELPHYS*

1. Inflorescences densely arranged, and much branched . . . . . 3. *H. zenkeriana*
Inflorescences loosely arranged, little branched **2**
2. Fruits obpyramidal with well-marked corners ; cymes strongly cincinnate, with internodes long . . . . 2. *H. violacea*
Fruits with more or less spherical lobes ; cymes not strongly cincinnate, with internodes short . . . . 1. *H. poggeana*

In the following enumeration of specimens, all are in the Herbarium of the Royal Botanic Gardens, Kew (K.), except those shown as being in the British Museum Herbarium (B.M.) or the Herbarium of the Jardin Botanique de l'État, Brussels (Bx.), or the Forest Herbarium, Ibadan, Nigeria (F.H.I.).

1. **Hypselodelphys poggeana** (*K. Schum.*) *Milne-Redhead*, comb. nov. *Trachyphrynium poggeanum* K. Schum. in Engl., Bot. Jahrb. **15,** 431 (1892).

Sierra Leone. Moyamba District. Kissi Town, *Don* s.n. (B.M.). Wilberforce, *H. H. Johnston* 97. Mt. Leicester, *Barter* s.n. Njala, *Deighton* 1839. Tarania, *Deighton* 3372, 4615. Karene District. Duunia, *Scott-Elliot* 4884 (B.M., K.). Kambia District. Kambia, *Scott-Elliot* 4508 (B.M., K.). Kofin Mt., near Kukuna, *Scott-Elliot* 4622 (B.M., K.). Bombali District. Kumrabai, *N. W. Thomas* 6776. Bo District. Near Bumpe, *Deighton* 4968. Kenema District. Kenema, *N. W. Thomas* 7564, 7748. Pujehun District. Pujehun, *Lane-Poole,* 158. Without locality. *Afzelius* (B.M.), *N. W. Thomas* 8062, 8354.

Liberia. Without locality, *Linder* 347. Webo District, Diella, *Baldwin* 6338.

Gold Coast. Accra District. Near Nsawam, *Dalziel* 8291. Kpokoase, north of Achimota, *Irvine* 193.

Nigeria. Colony Division. Lagos, *Moloney* XXI. Abeokuta Division. Olokemeji, *Conservator of Forests* XI. Oyo Division. Ibadan, *Symington* 3358 (F.H.I.). Akure Division. Idanre above Aweba, *Brenan* 8689. ? Division. Yoruba Forest as far as Ijayo, *Barter* 3329. Onitsha Division. Awka, *N. W. Thomas* 43. Calabar Division. Oban, *Talbot* s.n. (K.) 874 (B.M., K.).

Gaboon. Corisco Bay, *Mann* 1909.

Portuguese Congo. Mayombe Forest, *Gossweiler* 7595.

Belgian Congo. District du Bas-Congo. Kimuenza, *Gillet* s.n. (Bx.). Near Sanda, *Gillet* 3572 (Bx.), *Gillet* 3420 (Bx.). Kutu near Lac Léopoldville II, *Laurent* s.n. (Bx.). District forestier central. Éala, *Pynaert* 672 (Bx.), *Lebrun* 239 *Léonard* 12 (K), 186 (Bx.), *Coûteaux* 272 (Bx.), *Staner* 937 (Bx.), *Laurent* 1963 (Bx.). Yangambi, *Louis* 3971 (Bx., K.), 7371 (Bx.), 8802 (Bx., K.), 14704 (Bx.), *Germain* 4629 (K.), 4632 (K.).

Angola. Lunda District. Dundo near River Luachima, *Gossweiler* 13677, 13685. Cuanza Norte District. Cazengo, *Gossweiler* 619.

The type specimen of *Trachyphrynium poggeana* K. Schum. is either Pogge 1445 or 1453, both specimens coming from Angola, "in der Campine" according to Schuman, a locality which I have been unable to trace. I have not seen these specimens, and am therefore unable to choose a lectotype. The other two specimens cited by Schumann (1892), p. 432, were later referred by Schumann (1902) to a new species, *Trachyphrynium zenkerianum* K. Schum. I do not consider that the variation in the degree of indumentum on the rhachis of the inflorescence mentioned by Schumann (1902), is of specific significance. The rounded cocci densely muricate with pyramidal processes about 2 mm. long are characteristic of the species.

2. **Hypselodelphys violacea** (*Ridl.*) *Milne-Redhead,* comb. nov. *Trachyphrynium violaceum* Ridl. in Journ. Bot. **25,** 133 (1887).

Sierra Leone. Pujehun District. Near Potoru, *Deighton* 3796. Pujehun, *Deighton* 5273. Sefalu, *Deighton* 5272.

LIBERIA. Kolahun District. Vahon, *Baldwin* 10242. Grand Cape Mount Co. Begwai, *Bunting* 106 (B.M.). Gbarnga District. Gbanga [Gbarnga] *Linder* 629. Salala District. Near Kakatown [Kakata] *Whyte* s.n. Webo District. Yratoke, *Baldwin* 6261.

PORTUGUESE CONGO. Mayombe Forest, *Gossweiler* 8071.

ANGOLA. Cuanza Norte District. Pungo Andongo, Mutollo, *Welwitsch* 6441 (type, B.M.). Pungo Andongo, Sobata Galanga, *Welwitsch* 6441b (B.M.). Cazengo, *Gossweiler* 4879.

I feel sure that this plant must be of more frequent occurrence than the above citations suggest. A fruit, damaged and immature, of *H. violacea* is in a packet on a sheet of *H. poggeana* from Nigeria (Barter 3329) suggesting that the two species may have been growing in proximity. I have not seen it elsewhere from Nigeria*, nor have I seen any material of it from the Gold Coast. A specimen of *H. zenkeriana* in the Brussels Herbarium (Zenker 274 of 1913) has a typical fruit of *H. violacea* detached and mounted on the sheet, suggesting that *H. violacea* may also occur at Bipindi in the French Cameroons. There seems to be a strong tendency for fruits of *Hypselodelphys* to be collected loose and attributed to the wrong species ; this has happened in more than one gathering received at Kew during this past year.

Specimen at Kew from Barombi, in the British Cameroons (Preuss 144, 321), named as *Trachyphrynium preussianum* K. Schum. may belong here, but they are not typical of *H. violacea*, and I prefer to await better material before being more definite. The fruit of *T. preussianum* figured by Schumann (1892), p. 429, fig. N, and (1902), p. 43, fig N, is typical of *H. violacea*, but here again proof that it belonged to a species similar to the two Preuss specimens just mentioned is lacking.

3. **H. zenkeriana** (*K. Schum.*) *Milne-Redhead*, comb. nov.

Trachyphrynium zenkerianum K. Schum. in Engl., Pflanzenr. IV, **48,** 45 (1902).

[*T. poggeanum* K. Schum. in Engl., Bot. Jahrb. **15,** 431 (1892), pro parte, quoad exempl. kamerunensia].

FRENCH CAMEROONS. Bipinde, *Zenker* 1223 (type dupl. B.M., K.), *Zenker* (coll. 1913) 274 (Bx.).

This species is easily recognized by its densely aggregated inflorescences. Schumann describes the fruit as having globose cocci, but, as mentioned under *H. violacea* above, Zenker 274 at Brussels has a detached fruit with pointed cocci mounted on the sheet. Observation in the field and further careful collecting will be needed before true nature of the fruit of *H. zenkerianum* can be finally settled.

Haumania *J. Léonard* in Bull. Jard. Bot. Brux. **19,** 453 (1949).

[*Trachyphrynium* (non Benth.).—K. Schum. in Engl., Bot. Jahrb. **15,** 432 (1892) et in Engl. & Prantl, Nat. Pflanzenfam., Nachtr. 2, 94 (1897), pro parte, quoad *T. danckelmanianum* J. Braun. et K. Schum.]

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*Whilst this note was in the press, I have seen excellent material of *H. violacea* collected in Nigeria by my colleague, Mr. R. D. Meikle, so the following citation should be added to those given above :—NIGERIA. Ibadan, near waterworks, in shade of secondary forest, 28 Jan. 1950, *Meikle* 1110.

[*Trachyphrynium* (non Benth.).—Bak. in Dyer, Fl. Trop. Afr. **7,** 318 (1898), pro parte, quoad *T. danckelmanianum* J. Braun et K. Schum.]

[*Trachyphrynium* (non Benth.).—K. Schum. in Engl., Pflanzenr. IV, **48,** 42 (1902), pro parte, quoad subgenus *Lasiodelphys* K. Schum.]

[*Trachyphrynium* (non Benth.).—Lemée, Dict. Gen. Phan. **6,** 643 (1935), pro parte, quoad spec. ovariis velutinis]

[*Trachyphrynium* (non Benth.).—Hutch. in Hutch. & Dalz., Fl. W. Trop. Afr. **2,** 337 (1936), pro parte, quoad *T. danckelmanianum* J. Braun et K. Schum.]

KEY TO THE SPECIES OF *HAUMANIA*

Stems armed with small curved prickles ; abaxial bract of inflorescence 2·0–2·3 cm. long ; sepals about 4 mm. long . . . . . 1. *danckelmaniana*

Stems unarmed ; abaxial bract of inflorescence 2·5–3·5 cm. long ; sepals about 11 mm. long . . . . 2. *liebrechtsiana*

1. **Haumania danckelmaniana** (*J. Braun et K. Schum.*) *Milne-Redhead*, comb. nov.

Trachyphrynium danckelmanianum J. Braun et K. Schum. in Mitth. Deutsch. Schutzg. **2,** 153 (1889).

BRITISH CAMEROONS. Barombi Station, *Preuss* 255. Dengding, 5° 10′ N., 13° 35′ E., *Mildbraed* 8825.

FRENCH CAMEROONS. Bipinde, *Zenker* 929, 3146 (Bx., K.) Yaunde Station, *Zenker & Standt* 610. Minfia, *Zenker* s.n. (Bx.) Near Douala, *Chew* s.n.

SPANISH GUINEA. Nkolentangan, *Tessmann* 60. Near Campo, *Tessmann* 684.

GABOON. Sibange Farm, *Soyaux* 85.

I have not yet seen the fruit of this species, but I have no doubt that it is not unlike that of the next species, and that the fruit figured by Schumann (1902), p. 43, fig. L, M, belongs to *Hypselodelphys poggeana.* I am informed by Mr. Chew, who is familiar with this plant around Douala, that it grows only in the areas of the heaviest rainfall, which may account for its rather restricted distribution.

2. **Haumania liebrechtsiana** (*De Wild. et Th. Dur.*) *J. Léonard* in Bull. Jard. Bot. Brux. **19,** 454 (1949).

Trachyphrynium liebrechtsianum De Wild. et Th. Dur. in Bull. Soc. Bot. Belg. **38,** 147 (1899).

PORTUGUESE CONGO. Mayombe Forest, *Gossweiler* 6880, 8181, 8273.

BELGIAN CONGO. District du Mayumbe. Temvo, *Vermoesen* 1481 (Bx.). Mayumbe, *Kesteleyn* s.n. (Bx.). District du Bas-Congo. Kitwit, *Vanderyst* 3087 (Bx.). Kimuenza, *Gillet* 1972 (Bx.). District du Kasai. Bena-Dibele, *Laurent* s.n. (Bx.), *Claessens* 206 (Bx.). Bena Makima, *Lescrauwaet* 267 (Bx.). District du Forestier Central. Éala and neighbourhood, *Léonard* 15 (K.), 187 (Bx.), *Robyns* 723 (K., Bx.), *Louis* 2199 (Bx.), *Laurent* 1125 (Bx.), 1961 (Bx.), *Seret* 1044 (Bx.), *Lebrun* 253 (Bx.), 527 (Bx.), *Naunan* 7 (Bx.), *Leemans* 542 (Bx.), *Pynaert* 1414 (Bx.), 1561 (Bx.), 1630 (Bx.). Wendji to Coquilhatville, *Lebrun* 622 (Bx.). Bolenge, *Laurent*

148 (Bx.). Lisala, *Bruneil* s.n. (Bx.). Yambata, *Montchal* 59 (Bx.), 177 (Bx.), *De Giorgi* 1409 (Bx.). Dundusana, *Mortchan* 217 (Bx.). Mobwasa, *Reygaert* 286 (Bx.), *Lemaire* 187 (Bx.), *Herb. Bang.* 397 (Bx.), *De Giorgi* 682 (Bx.). Basoko, *Claessens* 638 (Bx.). Bas-Uele, without locality, *Dewulf* 926 (Bx.), Buka, *Seret* 888 (Bx.). Near Banalia, *Galdermans* 12 (Bx.). Yangambi and neighbourhood, *Louis* 1513 (Bx.), 3853 (Bx.). 3918 (Bx.), 5544 (Bx., K.), 8092 (Bx.), 8668 (Bx.), 8934 (Bx.), 9781, (Bx., K.), 10050 (Bx.), 10242 (Bx.), 13220 (Bx.), 13967 (Bx.), 14895 (Bx.), *Bequaert* 1359 (Bx.). Kama to Lumuna, *Lebrun* 5853 (Bx., K.).

This species, as will be seen by the above citations, is widely spread in the equatorial forests of the Congo Basin, but is unkown from elsewhere apart from the nearby Mayombe Forest. It's distribution does not appear to overlap that of its ally, *H. danckelmanianum*. The rich material of *H. liebrechtsiana* at Brussels has been only partly cited here ; specimens without localities on the labels and with localities that I could not decipher have been omitted.

Acknowledgments

The above work has been greatly assisted by the loan of the rich material from the Jardin Botanique de l'État, Brussels, through the kindness of Professor W. Robyns, to whom I offer my sincere thanks. I am also indebted to Dr. J. Léonard of I.N.É.A.C., who has placed at my disposal the excellent material, both dried and preserved in liquid, of the genera collected by him and by the late Dr. J. Louis in the Congo, and who has most kindly allowed me to see the typescript of his most valuable paper on the *Marantaceae* of the Belgian Congo, shortly to be published. His ready co-operation is very greatly appreciated. I would also like to thank the Keeper of Botany at the Natural History Museum, and my friend Mr. J. E. Dandy for facilities and help in consulting specimens in the Department of Botany.

The collections at Kew of these genera, as of the African *Marantaceae* in general, have been greatly enriched through the efforts of certain correspondents in Africa. It is impossible here to mention all their names, but I would like to thank them for their great assistance, in particular Mr. F. C. Deighton, O.B.E., Department of Agriculture, Sierra Leone, Dr. J. T. Baldwin Jr., William and Mary College, Virginia, Mr. R. W. J. Keay, Forest Herbarium, Ibadan, Dr. R. Germain, I.N.É.A.C., Yangambi, Belgian Congo, and Dr. W. J. Eggeling, Conservator of Forests, Uganda. Much help has also been received from my colleagues Messrs. J. P. M. Brenan, R. D. Meikle, H. K. Airy Shaw and P. Taylor.

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National Parks, Reserves and Phytogeographical Districts of the Belgian Congo.—Each of the two works noticed here consists of a map accompanied by 10 pages of explanatory text in French and Flemish. The first one shows, marked in colour on the map, which is on a scale of 1 : 5,000,000, the National Parks, game and forest reserves of the Belgian Congo and Ruanda-Urundi, and the map is admirably clearly printed and easy to understand. The text gives a brief history of how the making of reserves in the Congo has developed, followed by a definition of their purposes, and then a numbered list of the reserves themselves and their position, the numbers being correlated with those on the map.

The second work treats the plant-geographical districts of the Belgian Congo and Ruanda-Urundi in the same way, and is equally clear and concise. The text briefly describes the position, climate and vegetation, mentioning a number of the principal species, of each of the eleven districts.

Both these maps will be of great value not only to botanists, but also to geographers and all who are interested in the wild life of tropical Africa. That on the National Parks is particularly topical in view of the creation of similar parks in England, and of the urgent need for them in British territories in Africa, before unique and irreplaceable areas of vegetation have been sacrificed to politicians' views on economics and expediency.

That on the plant-geographical districts is a necessity for botanists, since these districts are being used standardly not only in the publication of new species from the Jardin Botanique de l'Etat in Brussels, but also in the great new Flore du Congo Belge et du Ruanda-Urundi.

J. P. M. BRENAN.

Atlas Général du Congo : Les Parcs Nationaux et les Réserves du Congo Belge et du Ruanda-Urundi. By Prof. Dr. W. Robyns Institut Royal Colonial Belge, No. 13, 1948. 1 Map, 10 pp. Price 130 fr. Les territoires phytogeographiques du Congo Belge et du Ruanda-Urundi. By Prof Dr. W. Robyns. Institut Royal Colonial Belge, No. 410 1, 1948. 1 Map, 10 pp. Price 130 fr.

Adaption and Origin in the Plant World.* — Despite the title of this work its subject matter sheds little light on the part played by environment in evolution, indeed the conditions of experimentation with clones of the same individual obviously exclude any selective action of the environment as between strains within a species. The text and in particular the excellent and numerous illustrations are chiefly concerned with the effect on different species of cultivating them at varying altitudes in transplant gardens and in various types of soil in various types of illumination and moisture and in different densities. Whilst it is obvious that this is a record of considerable labour these pages do not take us much further than the classical experiments of Bonnier despite the greater elaboration of technique. Data as to light conditions, temperature, soil moisture, et. cet. are furnished, but it is difficult to obtain anything approaching a sufficient picture of the relevant conditions in any particular experiment to assess adequately its real significance. No doubt this is largely due to the posthumous character of this record which Mrs. Clements had to compile from such data as were available.

E.J.S.

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*Adaptation and Origin in the Plant World, the Role of Environment in Evolution, by F. E. Clements, E. V. Martin, and F. L. Long. Chronica Botanica Co., Waltham, Mass. and Wm. Dawson & Sons, London. $6.00.

PRELIMINARY REPORT ON COLLECTIONS OF THE LARGER FUNGI MADE BY THE ASSISTANT MYCOLOGIST IN TRINIDAD B.W.I. DURING THE AUTUMN 1949.

As a result of a request from Imperial College of Tropical Agriculture the assistant mycologist made collections of fungi, principally Agarics and Discomycetes, in Trinidad during the latter part of the wet season 1949, viz from 20th September to 4th December, excluding the week 15th-21st November, spent in Venezuela.

Studies of these groups of fungi in the West Indies have hitherto been made only by Berkeley and Patouillard, who worked only from ill-preserved dried material, and by Murrill, who studied them in the field but published only incomplete diagnoses which have proved quite inadequate for recognition of his species by subsequent workers. During the visit now reported approximately 600 collections were made in Trinidad and opportunity was taken of the laboratory facilities at the Agricultural College to make water colour drawings of all the species represented, with accompanying notes of essential microscopic and ephemeral characters. A further 100 collections were made in Venezuela and on the return voyage via Jamaica opportunity was taken of revisiting several of Murrill's localities in that island and of securing another 200 collections i.e., approximately 900 collections in all. At the request of other members of the herbarium staff some time was also devoted to collecting 40 marine algae from Trinidad, and 82 packets of fern spores to supplement the collection of living ferns at Kew.

A list of localities sampled is given in table 1, with approximate altitudes and the type of vegetation at each, according to the classification elaborated by Beard, 1946.

Preliminary Conclusions.

1. As a result of these collections adequate descriptions can now be drawn up of about 310 Agaric species occurring in Trinidad, belonging to about 44 genera. Although the Agaric flora is thus rich in species they mostly occurred singly or in small numbers and were rather inconspicuous, in few did the pileus exceed 1 inch in diameter. There is a strking contrast with the large numbers of a few conspicuous species which characterise temperate forests in the Agaric season.

2. In Trinidad, where the highest peaks only slightly exceed 3000 feet, there was no indication of a zoning of fungi according to altitude above sea level. Nor was there any indication of an infiltration of temperate species at the higher altitudes. In Jamaica, on the contrary, a rich Agaric flora of temperate facies was found in the forests of the Blue Mountains between 5000′ and 7000′. Here occurred 4 species of *Cortinarius*, 3 of *Inocybe* and 1 of *Boletus*, genera not represented in Trinidad.

3. Remarkably few Discomycetes, especially inoperculate species, were found in Trinidad. The temperate Agaric flora of the Blue Mountains, however, was accompanied by an abundant Discomycete flora rich in inoperculate species.

4. Several large and conspicuous species familiar to the local mycologists at the beginning of the rainy season in June were not seen in Trinidad during the autumn. It appears therefore that there is some seasonal variation in the Agaric flora. It may tentatively be suggested that this may be correlated with the rapid leaching of nitrogen from Trinidad soils known to occur during the rains. Almost all the savanna Agarics seem to belong to this group confined to the early rains.

5. Although the same genera occur in the western tropics as in temperate forests their relative proportions are very different. In Table 2 is set out the number of species in each genus found in Trinidad and the percentage of the known Agaric flora represented by each of the larger genera. In the 3rd and 4th columns appear the corresponding percentages in the British Agaric flora and in that met with about 5000′ up in the Blue Mountains of Jamaica. Attention may be drawn to the high proportion of tough textured species (*Marasmius* and allies 24·3%) in the tropical flora and the absence or reduction in the large fleshy genera egs. *Amanita*, *Tricholoma*, *Clitocybe*, *Lactarius*, *Russula*, *Pholiota*, *Cortinarius* and *Inocybe*. The prominence of *Lepiota* and *Hygrophorus* agrees with what is known of the prevalence of these genera in the eastern tropics.

6. Preliminary comparison of the species of *Marasmius* and allies with those recently well described and figured from Ceylon by Petch (1947) indicates very few species common to the two areas.

7. The absence of the mycorrhiza-forming genera *Cortinarius* and *Boletus* from Trinidad seems to be related to the absence of the ectotrophic type of mycorrhiza in Trinidad forest trees.

8. Of the Trinidad Agarics a remarkably high proportion, almost exactly 66%, grew on wood or on debris in the early stages of decomposition and only 33% on the ground or thoroughly disintegrated humus.

9. Probably to be correlated with absence of mycorrhiza was the absence of any indication of a constant association of terrestrial species with any particular forest tree.

10. The well known parasite of Coffee, *Omphalia flavida* was found parasitising native plants in virgin rain forest in both Trinidad and Jamaica. The fungus is evidently native to both islands and reservoirs of infection for coffee may be expected to occur in the native rain forests throughout the West Indies. The Cacao parasite, *Marasmius perniciosus* was not observed on any other host. The dangerous root parasites *Clitocybe tabescens* and *Armillaria mellea* appear to be unknown in Trinidad.

Table 1. *Localities sampled and types of Vegetation.*

Locality	*Altitude*	*Dates Visited*	*Type of Vegetation.*
Trinidad			
Northern range N. of Arima	2000′	25.IX ; 4.XII	Lower Montane Rain Forest
Naranja	2000′	2.X ; 27.XI	Lower Montane Rain Forest
El Tucuche	2000–3000′	2.X	Montane Rain Forest
Aripo	1500–2500′	23.X	Montane Rain Forest
Upper Caura Valley	1000′	13.XI., 27.XI	Lower Montane Rain Forest
Morne Bleu	2000–2700′	4.XII	Lower Montane Rain Forest
Maqueripe trail	500–700′	24.XI ; 29.IX ; 27.X	Secondary Rain Forest
Diego Martin	150′	22.IX ; 24.IX	Cacao Plantations
Santa Cruz	400′	26.X	Cacao Plantations
Non Pareil, Sangre Grande	100–500′	11.X ; 19.X	Cacao and Hevea Plantations
L'orange, Aripo Valley	600′	13.X	Plantations
Matura Reserve	100′	16.X	Evergreen Seasonal Forest Mora type
Arena	100′	5.X ; 30.X ; 1.XII	Evergreen Seasonal Forest
Erin	50–200′	6.XI	Evergreen Seasonal Forest
Siparia	100′	3.XI ; 5.XI	Semi-Evergreen Seasonal Forest
Quinam	0–100′	4.XI	Semi-Evergreen Seasonal Forest
Mt. Tabor	1000–1500′	13.XI ; 27.XI	Degraded Deciduous Seasonal Forest
Cocal	0′	22.IX	Coconut Plantations
St. Augustine	50′		Banana Plantations and Gardens
”	”		Savanna
Tacarigua	50′		”

Locality.	*Altitude.*	*Dates Visited.*	*Type of Vegetation.*
Port of Spain	25–100′	9.XI ; 11.XI ; 25.XI	Savanna and Botanic Gardens
St. Joseph	25′	20, 21, 25, 27 IX. 7, 14, 18, 20 X. 10, 30 XI.	Bamboo Plantation
Tobago			
Hermitage	800–2000′		Lower Montane Rain Forest
Mt. Dillon	1000–1500′		Shifting Cultivation
Venezuela			
Caracas	3000′	15.XI	Botanic Garden
Rio Chacaito	3000′	18.XI	Thin Seasonal Forest
El Junquite	6000′	16.XI	Cloud Forest
Rancho Grande, Maracay	3000–4000′	19–20.XI	Montane Rain Forest
Jamaica			
Castleton	500′		Botanic Garden
Long Mountain	600–900′		Acacia-Haematoxylon Coppice
Quickstep	1200′		Seasonal Forest
Hermitage	1700′		Reservoir Grounds
Cinchona	5000–6700′		Pine Forest, Secondary Rain Forest and Elfin Woodland

Table 2. *Genera of Agaricaceae represented in Trinidad.*

Genus	*No. of species seen*	*% of total*	*Corresponding Great Britain*	*% in flora of : Blue Mountansi Jamaica*
Amanita	1	0·3	1·3	—
Lepiota	37	11·8	4·7	—
Armillaria	1	0·3	0·2	—
Tricholoma	6	2·0	5·4	2·0
Ripartites	1	0·3	0·1	—
Rhodopaxillus	1	0·3	0·6	—
Clitocybe	2	0·6	4·1	—

Genus	*No. of species seen*	*% of total*		*Corresponding Great Britain*		*% in flora of: Blue Mountains Jamaica*	
Heimomyces	1	0·3		0		—	
Collybia	40	12·8	24·3 %	5·2	5·9%	20·0	22%
Marasmius	25	8·0		0·6		2·0	
Crinipellis	5	1·5		0·1		0	
Dictyoploca	6	2·0		0		0	
Mycena	17	5·8		5·0		8·0	
Omphalia	10	3·2		3·5		6·0	
Pleurotus	8	2·5		2·1		4·0	
Panus	4	1·2		0·3		2·0	
Hygrophorus	20	6·4		5·0		10·0	
Lentinus	4	1·2		0·5		—	
Laccaria	1	0·3		0·5		2·0	
Cantharellus	1	0·3		0·6		—	
Lactarius	2	0·6		4·0		—	
Russula	3	1·0		5·4		2·0	
Dictyopanus	1	0·3		0		2·0	
Arrhenia	1	0·3		0		—	
Favolaschia	2	0·6		0		2·0	
Volvaria	3	1·0		0·9		—	
Pluteus	6	2·0		2·0		2·0	
Rhodophyllus	19	6·0		5·2		4·0	
Claudopus	1	0·3		0·2		—	
Flammula	2	0·6		2·0		—	
Pholiota	2	0·6		2·3		4·0	
Galera	6	2·0		1·5		4·0	
Naucoria	4	1·2		2·1		—	
Tubaria	2	0·6		0·7		—	
Crepidotus	2	0·6		0·7		—	
Bolbitius	1	0·3		0·2		—	
Cortinarius	0	0		14·0		8·0	
Inocybe	0	0		5·0		6·0	
Agaricus	12	3·9		2·0		4·0	
Panaeolus	4	1·2		0·5		—	
Hypholoma	1	0·3		1·1		—	
Psilocybe	3	1·0		1·5		6·0	
Psathyrella	12	3·9		1·7		—	
Stropharia	1	0·3		1·5		—	
Melanotus	1	0·3		0		2·0	
Coprinus	12	3·9		3·3		2·0	
Boletus	0	0		3·3		2·0	

NEW FUNGI.

R. W. G. DENNIS.

A Smut on Elytrophorus.

Tilletia elytrophori *Dennis*, sp. nov. Soris ovariicolis, 2–3 mm. longis, membrana cinereo-fusca vestitis. Sporis globosis vel subglobosis, fusco-brunneis, 23–26 × 23µ, episporio reticulato, hyalino, 5µ crasso.
Hab. in ovariis Elytrophori africani.

Typus : in Herb. Kew. ex *R. H. Hornby* 2979, Poole, Hartley District, Southern RHODESIA, 15.V. 1948.

Inoperculate Discomycetes from Sierra Leone.

Unguiculella caespitosa *Dennis*, sp. nov. Apotheciis erumpentibus, gregariis et hinc inde pluribus contiguis, scutellatis, 0.4 mm. diam., late sessilibus ; disco plano, hyalino ; excipulo prosenchymatico, e cellulis hyalinis rectangularibus tenuiter tunicatis circa 4-5 × 2µ composito, externe piloso ; pilis numerosis, hyalinis, e basi bulbosa, filiformibus, continuis, acutis, apice recurvatis, c. 20 × 2–3µ. Ascis clavatis, apice rotundatis, octosporis, 20–25 × 5–6µ ; sporidiis distichis, oblongis, hyalinis, 3–5 × 2µ ; paraphysibus filiformibus 1µ crassis.
Hab. in ramulis emortuis Theobromae cacao.

Typus ; Njala, SIERRA LEONE 4.X.1949, *F. C. Deighton* M3179F, in Herb. Kew. This fungus seems allied to *U. aggregata* (Feltg.) von Höhn. but has smaller asci and spores. It lacks the hooked paraphyses of some *Unguicullela* species and in this approaches *Hyaloscypha* sensu Nannfeldt. It is, however, doubtful if Nannfeldt's interpretation of *Hyaloscypha* can be sustained as it excludes both the foundation species of the genus.

Pezolepis naucleae *Dennis*, sp. nov. Ascomatibus erumpentibus, gregariis, amphigenis, scutellatis, sessilibus, disco convexo, ochraceo, 0.2–0.4 mm. diam. ; excipulo parenchymatico, fuscidulo ; hypothecio hyalino ; ascis clavatis, octosporis, 80–100 × 15–17µ ; sporidiis distichis, oblongis, hyalinis, continuis, 18–13 × 6–7µ ; paraphysibus filiformibus, apicem versus ramosis, conglutinatis, epithecium flavidulum formantibus.
Hab. in foliis vivis Naucleae.

Typus : SIERRA LEONE 23.XI.1949, *F. C. Deighton* M3351, in Herb. Kew. Superficially this interesting species closely resembles a *Pseudopeziza* but the gelatinized hymenium and coloured epithecium are unlike features of that genus. The " excipulum ", which forms a denticulate, dark brown margin to mature fructifications, seems to arise as a disc of brown, parenchymatous cells within the host epidermis overlying the young hymenium. The structure is thus somewhat Hemisphaeriaceous and the fungus seems to be a pseudo-discomycete.

KARSTEN'S SPECIES OF MOLLISIA.

R. W. G. DENNIS

The type material of any species is necessarily limited and that of fungi described by the nineteenth century mycologists is usually extremely scanty. As each examination of the type of a microscopic fungus usually involves making a mount there is often a danger of the type being eventually completely destroyed. Hence it is important that anyone who re-examines types of microscopic fungi should place on record any observations complementary to those in the original diagnosis.

The writer has recently had occasion to re-examine critically the types of those species of Mollisia described by Karsten in Mycologia Fennica. P. A. Karsten's work is remarkable for its reliability and accuracy, especially in his microscopic measurements but it is not surprising that he omitted from his diagnoses characters which a further 80 years of research have shown to be essential. It should be noted that the colours of apothecia quoted in the following descriptions are those of type material now mostly at least 80 years old. As regards colour Karsten's original diagnoses will probably be found more helpful by the mycologist trying to identify fresh collections. For example, the apothecia of *Mollisia hydrophila* (Karst.) Sacc. in Fung. Fenn. 643 may now fairly be described as yellow ochre ; Karsten described them when fresh as " tota albida vel albido-pallentia, interdum sordide albida vel cinerescentia sicca (extus) colore immutata aut fusca vel fuscescentia ". In the writer's opinion much stress should not be laid on small colour differences between old collections of these soft-fleshed fungi.

The following descriptions are arranged under the numbers allotted to the species in Mycologia Fennica Vol. I, 1871, which is probably the most generally accessible of Karsten's works, though it does not contain his final opinion of their systematic position. Numbers not quoted below were assigned by Karsten to species originally described by other authors, the types of which are not, therefore, in his herbarium at Helsinki.

All details in the descriptions have been obtained from the same apothecium, from which both freezing microtome sections and crush preparations have usually been studied.

Though several of the species described below are clearly referable to genera other than *Mollisia* the writer believes it undesirable to publish formal recombinations in those genera until the types of more of the very large number of small inoperculate discomycetes described prior to 1869 have been restudied. Until this has been done one can feel no confidence that the epithets selected by Karsten will not be reduced to synonymy.

1. **Mollisia ramealis** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 187 (1871).

Peziza (*Nodularia*) *ramealis* Karst. in Not. Sallsk. Fauna Flora Fennica **10,** 155 (1869).

Apothecia gregarious, sessile, erumpent from between the bark and wood of small dead branches. Disc about 1 mm. across, flat, becoming slightly convex when moist, burnt sienna when dry, brighter and yellower when fresh yielding a sulphur yellow solution in 10 per cent. KOH. Receptacle dark brown, paler at the margin, downy, irregularly cupshaped and seated on a broad base. Flesh white, of hyaline, loosely interwoven, rather thin-walled hyphae about 3μ wide, becoming parallel and radially arranged towards the outside. Excipulum brown, of more or less spherical, thin-walled, isodiametric cells, about 8–10μ across, those towards the margin more elongated and arranged in rows, clothed throughout with cylindrical thin-walled, hyaline 0–1 septate hairs, up to about 30 × 4μ. Asci cylindric-clavate, indistinctly stalked, apically narrowed to the small pore, which stains deep blue in Melzer's reagent, 75–100 × 7–8μ, 8-spored. Ascospores biseriate, fusiform, straight or slightly curved, 21–27 × 2–2·5μ, according to Karsten " 14–30 × 2-3μ, spurie tenuiter uniseptatae ". Paraphyses cylindrical or slightly enlarged upwards, then rather sharply narrowed to an almost pointed tip, 3–4μ broad, not longer than the asci. (Fig. 1). On bark of dead twigs of *Betula*.

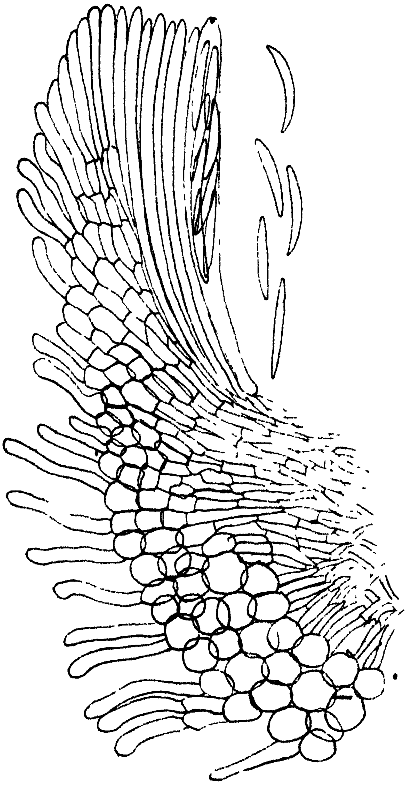

FIG. 1. *Mollisia ramealis*. Section through apothecial margin and 5 free ascospores × 500.

There are three collections in Herb. Karsten, dated respectively 22 Oct. 1866, 18 Sept. 1868 and 27 July 1869. The above description is drawn up from the first of these but all are evidently conspecific though the second shows considerable variation in colour of the disc.

As pointed out by Karsten in Hedwigia 1892 p. 298 this is not the fungus described by Rehm as *Niptera ramealis* (Karst.) Karst. and subsequently renamed *Niptera ramincola* Rehm. Karsten's fungus described above appears to be very near or perhaps identical with *Helotiella citrinella* Sacc. but its systematic position is a matter of some difficulty. It is not a typical *Mollisia* and in its erumpent habit and excipular structure it recalls some Scleroderridoideae. In 1869 Karsten erected for it a monotypic subgenus of *Peziza*, *Nodularia*, but this cannot be raised to generic rank as the name is already preoccupied. Possibly *Helotiella* Sacc. may be the place for *M. ramealis* but I have not yet seen the type of that genus, which was also unknown to Nannfeldt (1932) who suggested that *M. ramealis* had affinities with *Orbiliopsis*. That suggestion unfortunately is not very helpful as the place of *Orbiliopsis* itself in Nannfeldt's system is somewhat uncertain. There are at Kew the following British collections of *M. ramealis* both on *Betula* :—

Kinnoull Hill, Perth, A. M. Rogers, 30. VIII, 1911.

Netley Heath, Surrey, 6. VI. 1948.

2. **Mollisia ventosa** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 188 (1871).
Peziza ventosa Karst. in Not. Sallsk. Fauna Flora Fennica **10,** 157 (1869).

Apothecia gregarious, often in small clusters, superficial. Disc grey, concave or flat with a well defined rim, with a distinct yellowish tint when moist, the large apothecia irregularly lobed up to 2 mm. across. Receptacle saucer-like, with a broad base, black with a paler margin and somewhat ribbed when dry, watery grey when moist, smooth throughout. Flesh white, of small hyaline, angular cells, passing radially into radiating parallel hyphae forming the excipulum,the outermost cells broad with rounded ends and thin dark-brown walls. Over most of the receptacle this outer zone of dark cells is only 1–2 cells thick and towards the margin it is entirely lacking. Asci very long cylindric-clavate, with slender stalks and narrowed apices, the pore deep blue in Melzer's reagent, 90–120 × 6–7μ, 8-spored. Ascospores mainly uniseriate, fusiform, straight or slightly curved, 1-septate, 10–15 × 2–3μ (10–20 × 2–3·5μ and up to 3 septate according to Karsten). Paraphyses slender cylindrical, about 1μ thick, not exceeding the asci. The description is based on Fungi Fennici 733, on bare wood of *Salix* in June. Structurally this species is closely allied to *Belonopsis excelsior*.

3. **Mollisia caespiticia** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 189 (1871).
Peziza caespiticia Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 159 (1869).

Apothecia erumpent from bark in small dense clusters, sometimes (? always) seated on the clustered ostioles of an immersed Pyrenomycete, often deformed by mutual pressure. Disc dark grey, up to 1·5 mm. across, usually irregular, concave when dry, flat or slightly convex when moist. Receptacle drab coloured, smooth, obconical. Flesh white, of thinwalled, small, angular, hyaline cells. Excipulum thick, of more or less isodiametric cells about 8–12μ broad, with thin brown walls, sometimes running out at the surface into short hyaline, obtuse, thinwalled hairs. Asci cylindric-clavate, not distinctly stalked, rounded above, the pore *not* blue in Melzer's reagent, 30–40 × 3–4·5μ, 8-spored. Ascospores narrowly fusiform or rounded at one end and pointed at the other, straight or very slightly curved, 4–7 × 1μ. Paraphyses not seen.

No type collection was specified in the diagnosis which states : " Supra corticem *Salicum* et *Ribis rubri*, prope Mustiala mensibus Majo, Septembri et Octobri observata, *Sphaerias* libenter incrustat ". The three collections in Herb. Karsten do not precisely correspond with this as all were made in October viz:—ad Ribes rub. 22 Oct. 1868 ; ad Sambuci 28 Oct. 1868 and on unnamed host 2 Oct. 1867, Ml (=Mustiala). The last named bears Karsten's notes and sketches and is that redescribed above. An English collection was published in The Naturalist 833, 76, (1950.)

4.* **Mollisia cinerea** (*Batsch*) *Karst.** **epibrya** (Karst.) Karst., Mycol. Fenn. **1**, 190 (1871).

Peziza epibrya Karst. in Not. Sallsk. Fauna Flora Fenn. **10**, 159 (1869).

Apothecia scattered, appearing superficial. Disc dark grey, concave when dry, flat with a low rim when moist, up to 750μ across. Receptacle cupshaped, often drying triangular, narrowed to a short stemlike base about 150μ across embedded in the moss tissue, smooth, sooty-brown. Flesh of very fine hyaline hyphae. Excipulum of parallel hyphae with very dark brown walls, lying at an acute angle to the surface, then curving upwards and lying almost vertically towards the margin, 2–3μ thick. (Fig. 2). Asci cylindric-clavate, short-stalked, rounded above with a small pore deep blue in Melzer's reagent, 60–70 × 7–8μ, 8-spored. Ascospores elliptic-clavate, often somewhat pointed at the lower end, 7–10 × 3–4μ. Paraphyses filiform about 1.5μ thick.

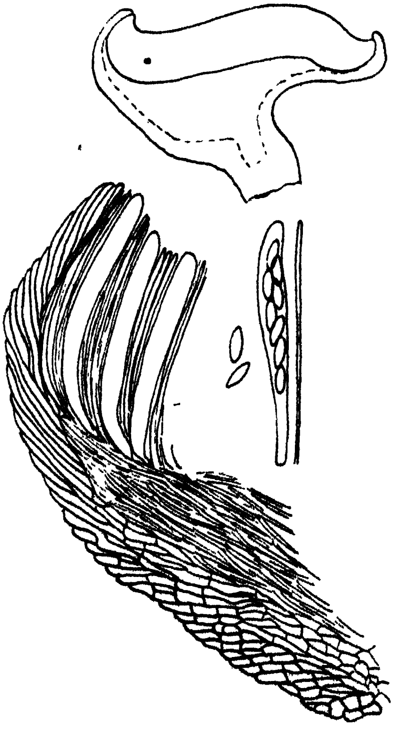

FIG. 2. *Mollisia epibrya*. Apothecium in vertical section × 50. Section through apothecial margin, ascus, paraphysis and spores × 500.

Type on moss Mustiala, Finland, 8 Oct. 1867. Moss cells surrounding the base of the apothecium are packed with the brown mycelium of the fungus, the hyphae about 4μ wide.

This is evidently a *Durella* and bears no anatomical resemblance to *M. cinerea.*

4.** **Mollisia cinerea** (*Batsch*) *Karst.*** **Mollisia fallens** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 191 (1871).

Trochila fallens Karst. in Not. Sallsk. Fauna Flora Fenn. **11** p. 217, (1870).

Mollisia fallens (Karst.) Sacc., Syll. Fung. **8** p. 332, (1889).

Apothecia scattered or in small groups, superficial. Disc grey-brown, up to 600μ across, concave when dry, flat with a distinct rim when moist. Receptacle cupshaped with a narrow base, blackish with a narrow almost white margin, smooth below, minutely downy above. Flesh white, of compact, hyaline, thinwalled, angular cells. Excipulum dark olive-brown, of isodiometric, somewhat angular cells with thin dark walls, the outermost rounded and, towards the margin, bearing short, brown, clavate thin-walled hairs about 10–15 × 4–5μ. The marginal cells are hyaline. Asci cylindric-clavate, indistinctly stalked, rounded above, the pore *not* stained blue in Melzer's reagent, 50–60 × 7–9μ, 8-spored. Ascospores biseriate, elliptic-cylindric, straight, 9–14 × 3–4·5μ. Paraphyses cylindrical or slightly enlarged upwards to the rounded apex, scanty, not longer than the asci.

There are three collections in Herb. Karsten, all on *Salix* bark, viz. 16 May 1868, 22 Oct. 1868 and 26 Oct. 1868, the second is that described above.

5. **Mollisia perparvula** (*Karst.*) *Karst.*, Mycol. Fenn **10,** 191 (1871).

Peziza perparvula Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 162 (1869).

Apothecia scattered, superficial. Disc concave, becoming almost flat when moist, up to 500μ across, drab coloured. Receptacle cup-shaped with a narrow base, smooth below but with a few brown basal hyphae anchoring it to the bark, minutely downy above, dark brown with a conspicuous paler margin. Flesh white, of compact, tightly interwoven, thinwalled, hyaline hyphae. Excipulum of more or less isodiametric cells up to 15μ across, with thin dark brown walls, occasionally, especially towards the upper part of the receptacle, running out into short, clavate, thinwalled hairs ; marginal cells narrower, paler, more rectangular and arranged in vertical series. Asci cylindric-clavate rounded above, the pore *not* stained blue in Melzer's reagent, 60–70 × 6–8μ, 8-spored. Ascospores biseriate, narrowly elliptical, straight, nonseptate, 7–12 × 2–3μ. Paraphyses cylindrical, not longer than the asci, about 2·5μ wide, rounded above. Type on bark of *Tilia*, Merimasku, Finland, August 1860.

6. **Mollisia complicata** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 192 (1871).

Peziza complicata Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 192 (1869).

Peziza cinerea Batsch lividula Nyl.* in Not. Sallsk. Fauna Flora Fenn. **10,** 61 (1869).

Apothecia scattered, superficial. Disc fuscous, concave with a prominent slightly incurved rim, up to 1 mm. across. Receptacle dark grey, cupshaped, seated on a very short, broad, stem-like base, smooth, texture when moist soft and elastic. Flesh of thin-walled, hyaline, interwoven hyphae. Excipulum about 40μ thick, sharply differentiated from the flesh, composed of parallel hyphae lying at a high angle to the surface except near the margin of the receptacle, where they tend to turn upwards parallel with the surface. Hyphae with thick, hyaline walls and thin septa, tinged slightly brown towards the surface, their ends sometimes protruding and thin-walled. Asci cylindric-clavate, almost sessile, rounded above, the pore *not* blue in Melzer's reagent, 50–65 × 5–7μ, 8-spored. Ascospores biseriate, cylindrical or slightly curved with each end rounded, often 1-septate, 10–12 × 2–2·5μ. Paraphyses cylindrical, slightly enlarged to 3μ towards their rounded tips, not longer than the asci (Fig. 3).

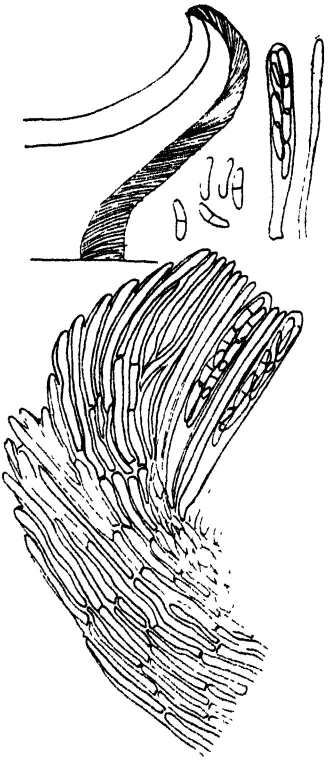

FIG. 3. *Mollisia complicata.* Half apothecium in vertical section × 50. Section through apothecial margin, ascus, paraphysis and spores × 500.

Type in Herb. Karsten on cut surface of a branch of *Salix caprea*, in Botanical Garden, Helsinki, W. Nylander, 5 Feb. 1863, first labelled *Peziza lividula* Nylander, later corrected to *Mollisia complicata* Karst.

This fungus is evidently an *Allophylaria* Karst. sensu Nannfeldt 1932 (=*Pezizella* Fuckel emend. von. Höhnel) and should be compared with *Peziza concolor* Phill. It is noteworthy that both Nylander and Karsten described the excipulum as composed of filaments adhering together and trending towards the margin, the surface subfurfuraceous with crystals of calcium oxalate. These were no longer apparent on the apothecium studied but are characteristic of some species of *Allophylaria*, such as *P. concolor* Phill. and *P. straminea* Berk. & Br., on which they are evidently excreted by the thin-walled tips of the excipular hyphae. The present species is in no way related to *Mollisia sublividula* sensu Karst.

6. ***Mollisia complicata** (*Karst.*) *Karst.** **Mollisia sublividula** (*Nyl.*) *Karst.*, Mycol. Fenn. **1,** 193 (1871).

Peziza sublividula Nyl. in Not. Sallsk. Fauna Flora Fenn. **10,** 61 (1869).

Mollisia sublividula (Nyl.) Sacc., Syll. Fung. **8,** 341 (1889).

Apothecia scattered, superficial or with a short peg-like base inserted in decorticated wood. Disc grey brown, concave, flattened when moist, up to 500μ across. Receptacle obconical or cupshaped, dark grey-brown, minutely downy. Flesh of the subhymenial region of small compact, thinwalled, hyaline cells. Excipulum of isodiametric or slightly radially elongated cells with thin dark brown walls about 7–12×5–8μ, running out at the surface, especially near the margin, into short, thinwalled, clavate hairs, mostly 1-septate and nearly hyaline. Asci cylindric clavate, not distinctly stalked rounded above, the pore *not* blue in Melzer's reagent 32–42×4·5–6μ.

Ascospores narrowly fusiform, 4–7×1·5μ. Paraphyses cylindrical about 2μ wide, not exceeding the asci.

This species was described very briefly by Nylander in a footnote to his Observationes circa Pezizas Fenniae and was based on a collection " In Gallia ad ligna vetusta ". It was also said to occur in England, for Nylander added " etiam in Anglia (unde misit rev. Bloxam nomine P. cinerea "), a record which appears to have been overlooked by compilers of lists of British Discomycetes. Karsten's collection here redescribed is therefore of no authority for the name as it is on wood of *Alnus*, Mustiala, Finland 6.XII.1868. The other collection on *Prunus* cited inMycologia Fennica has also been preserved but bears no notes beyond measurements of asci and spores. No collection from Bloxam certainly identifiable with that cited by Nylander can yet be identified at Kew.

It has seemed worth while to describe Karsten's material here because it was in this sense that the name *Mollisia sublividula* was taken up by Saccardo. It is, however, obviously highly desirable that search be made for Nylander's type.

7. **Mollisia sordidula** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 193 (1871).
Peziza sordidula Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 170 (1869).

Apothecia scattered, superficial. Disc vandyke brown and concave when dry, ochraceous tawny and flat with a low rim when moist, up to 300μ across. Receptacle cupshaped, vandyke brown, paler at the margin, smooth, the base sometimes slightly inserted in the substrate. Flesh a small-celled hyaline pseudoparenchyma. Excipulum hyaline throughout, of similar but larger cells, isodiometric about 5μ across below, more elongated on the flanks of the receptacle and replaced at the margin by vertical parallel hyphae about 5μ broad. Asci cylindric-clavate, scarcely stalked, pointed above, the pore deep blue in Melzer's reagent, 65-75 × 8–10μ, 8-spored. Ascospores irregularly arranged, fusiform or inequilateral, often slightly curved, 3-septate, 18-20 (–25 Karsten) × 3–4μ. Paraphyses very slender, about 1 μ thick. (Fig. 4).

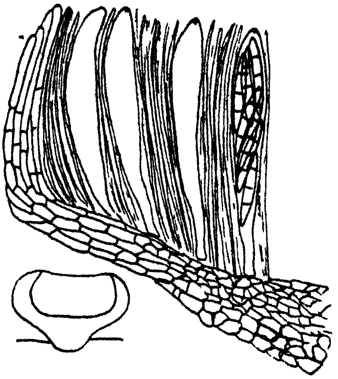

FIG. 4. *Mollisia sordidula.* Vertical section of apothecium × 50. Section through apothecial margin × 500.

The above description is based on Fungi Fenn. 751 on decorticated wood of *Pinus sylvestris.* This fungus is an *Orbiliopsis.*

8. **Mollisia emergens** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 194 (1871).
   Stictis emergens Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 254 (1870).

This is a typical *Hysteropezizella* and has been transferred to that genus by Nannfeldt (1932 p. 115).

9. **Mollisia luzulina** *Karst.*, Mycol. Fenn. **1,** 194 (1871).
   Naevia luzulina (Kårst.) Karst. in Acta Soc. Fauna Flora Fenn. **2** (6), 168 (1885).

   Phragmonaevia luzulina (Karst.) Rehm in Rabenh. Krypt. Flora **1** (3), 163 (1888).

Apothecia immersed, scattered, each surrounded by a dark brown rim of dead host cells and ring of loose cuticle, sometimes split into lobes. Disc flat, cinnamon buff, up to 300μ across, with a prominent concolorous rim. Receptacle saucershaped with a broad base, seated on the host mesophyll and enclosed by the upturned edges of the torn epidermis, smooth. Excipulum of thin-walled rectangular cells in layers parallel to the surface, those at the margin about 7–15 × 4μ. Asci cylindric-clavate, sessile, somewhat pointed above, the pore not usually blue in Melzer's reagent, though a few appear to show a minute apical blue spot, 40–50 × 4–5μ. Spores biseriate, fusiform or somewhat clavate, 8–15 × 1·5–2μ. Paraphyses cylindrical 1·5μ thick.

Type in dead leaves of *Luzula pilosa* Vasa, 22 July 1867. Nannfeldt (1932) cited this fungus among those probably to be transferred to *Laetinaevia* Nannf. This suggestion would seem to be well founded. According to Nannfeldt (Svensk. Bot. Tidskr. XXII p. 133, 1928) the species is common on leaves of Luzula spp. throughout Scandinavia.

10. **Mollisia pteridina** (*Nyl.*) *Karst.*, Mycol. Fenn. **1**, 194 (1871).
Peziza pteridina Nyl. in Not. Sallsk. Fauna Flora Fenn. **10**, 58 (1869).

Apothecia scattered, superficial. Disc concave, brown when dry, buff when moist, up to 400μ across. Receptacle cupshaped with incurved margin when dry, opening and splitting to give a crenate margin when moist, seated on a broad base, smooth. Flesh in the hypothecium of fine interwoven hyphae, in the base of the receptacle of thinwalled, isodiametric, hyaline cells. Excipulum of thinwalled, almost hyaline rectangular cells about 6–10×4μ, in rows parallel to the surface. Asci cylindric-clavate, almost sessile, rounded above, the small pore blue in Melzer's reagent, 35–45×4–6μ, 8-spored. Ascospores biseriate, fusiform or slightly clavate, 5–10×1–2μ. Paraphyses cylindrical or slightly enlarged upwards, rounded at the apex, about 2μ broad, not exceeding the asci (Fig. 5).

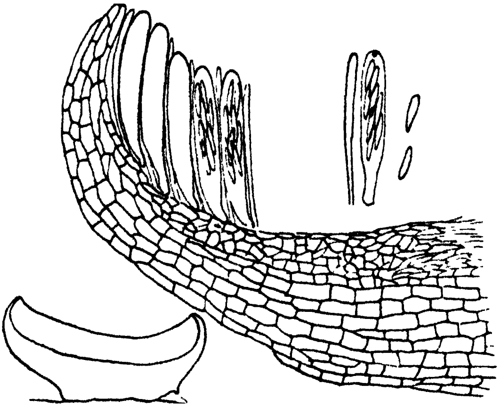

Fig. 5. *Mollisia pteridina.* Vertical section of apothecium×50. Section through apothecial margin, ascus, paraphysis and spores×500.

On dead stem of *Pteridium aquilinum.* Specimen examined in Herb. Karst., Merimasku, Finland, undated but bearing full notes and sketches of microscopic details on the packet. Though the species was named by Nylander, Karsten's material may be accepted as authentic, for Nylander was renaming a fungus misdetermined by Karsten as *Peziza pteridis* A. & S. and cited as the type "ad stipites vetustos *Pteridis aquilinae* in Merimasku, regionis Aboensis, vere (P. A. Karsten)".

Structurally this is not a typical *Mollisia* but it somewhat resembles *Peziza cornea* Berk. & Br. transferred to *Mollisia* by von Höhnel and may provisionally be retained in that genus.

11.* **Mollisia palustris** (*Rob.*) *Karst.** **hydrophila** (*Karst.*) *Karst.*, Mycol. Fenn. **1**, 196 (1871).

Peziza hydrophila Karst. in Not. Sallsk. Fauna Flora Fenn. **10**, 163 (1869).

Mollisia hydrophila (Karst.) Sacc., Syll. Fung. **8**, 345 (1889).

Apothecia scattered, superficial, Disc when dry yellow-ochre, flat with a low rim, when moist grayer, slightly convex without a rim, up to 1 mm. across. Receptacle saucershaped sessile on a small base, brown, smooth. Flesh of loosely woven hyaline, slender hyphae about 2μ thick, radially arranged as they approach the excipulum. Excipulum of 2–3 layers of almost isodiametric, thinwalled cells, the inner almost hyaline, the outer in the lower part of the receptacle with thin brown walls, about 6–8μ across. Asci cylindric-clavate with short, ill-defined stalks, narrowed above to the small pore deep blue in Melzer's reagent, 8-spored, about 50×5–6μ, up to 70×7μ according to Karsten. Ascospores biseriate, fusiform, 8–13×1·5–2·5μ, nonseptate, straight. Paraphyses cylindrical or slightly enlarged below the tip, about 2–2·5μ thick. On dead culms of *Phragmites communis*, description based on Fung. Fenn. 643.

11.** **Mollisia palustris** (*Rob.*) *Karst.*** **simillima** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 196 (1871).

Peziza hydrophila Karst.* *Peziza simillima* Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 163 (1869).

Niptera palustris Rob.** *N. simillima* (Karst.) Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 247 (1870).

Apothecia scattered singly or in small groups, superficial. Disc slightly concave when dry, flat without a rim when moist, pale buff when dry, fuscous from the underlying dark excipulum when wet, up to 800μ across. Receptacle shallow saucershaped with a broad base, dark brown, smooth. Hypothecium of slender interwoven hyphae about 2μ thick. Excipulum of more or less isodiametric cells, the inner somewhat angular hyaline and thinwalled, the outermost rounded with thin brown walls about 8–12μ across, narrower, more elongated and clavate towards the margin. On the flanks of the receptacle and beside the hymenium the inner zone of hyaline parenchyma is not developed. The apothecium rests on a thin web of hyaline subicular hyphae about 2μ wide. Asci cylindric-clavate, 50–60×5–6μ, indistinctly stalked, somewhat rounded above, the pore deep blue in Melzer's reagent, 8-spored. Ascospores biseriate fusiform or clavate, pointed at the lower end, 9–14×1–2μ. Paraphyses cylindrical or slightly enlarged upwards to 3–4μ, slightly longer than the asci. (Fig. 6).

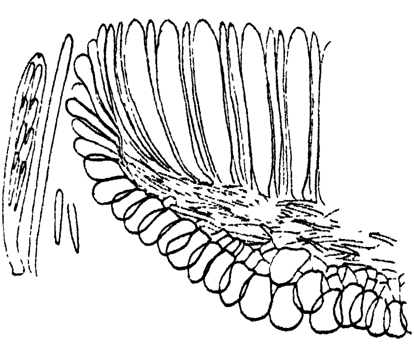

FIG. 6. *Mollisia simillima.* Section through apothecial margin, ascus, paraphysis and spores × 500.

On rotting culms of *Juncus conglomeratus*, type, Mustiala, Finland, 20 August, 1868.

Karsten was clearly unwilling to accord this fungus full specific status but the name *Mollisia simillima* Karst. was printed as that of a distinct species by Saccardo in Syll, Fung. VIII p. 347, 1889.

Authentic material of *Peziza palustris* Rob. in Herb. Berkeley has the same structure but slightly smaller asci about 40×5μ, with spores 9–11×1–2μ. There seems no reason for maintaining Karsten's fungus as even a variety of *M. palustris*. This was evidently his own opinion in later years for in Revisio atque synopsis Ascom. fenn. (Acta Soc. pro Fauna Flora Fennica II (6) p. 135, 1885) *M. palustris* is listed with a subspecies* *M. hydrophila* but *M. simillima* and *M. epitypha* have disappeared without comment.

11.*** **Mollisia palustris** (*Rob.*) *Karst.**** **epitypha** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 197 (1871).

Niptera palustris Rob.** *N. epitypha* Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 247 (1870).

Apothecia scattered or in pairs, superficial. Disc slightly concave when dry, flat or slightly convex without a rim when moist, yellowish-buff when dry, light grey when moist, up to 1 mm. across. Receptacle very dark brown, shallow saucer-shaped, seated on a broad base. Hypothecium of fine, hyaline, interwoven hyphae, remainder of the flesh of small angular cells passing inperceptably into a zone of large, hyaline, thin-walled, isodiametric cells like those of the inner part of the excipulum in *M. simillima*. Outermost layer of cells in the excipulum rounded with rather thin brown walls, about 10×8μ, narrower and more clavate towards the margin. Subicular hyphae not observed. Asci cylindric clavate, 50–60×5–6μ, 8-spored, not distinctly stalked, narrowed above to the small pore stained deep blue in Melzer's reagent. Ascospores uniseriate or irregularly biseriate, narrowly fusiform-cylindric or slightly more pointed at the lower end, 10–14×2μ. Paraphyses cylindrical, slightly enlarged upwards, about 2μ wide, septate. On rotting leaves of *Typha latifolia*; type, Mustiala, Finland, 20 Sept. 1868.

This is clearly no more than a host form of *M. simillima* and like it should be reduced to synonymy under *M. palustris*.

This is one of the few species in which Karsten at first miscalculated his spore measurements, though he corrected the error before publication. His note on the type packet reads "19-20-24, 3-3.5-4", whereas the spores are actually, as published, half this size viz. 10–14×2μ.

14. **Mollisia junciseda** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 198 (1871).
Peziza junciseda Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 164 (1869).

Apothecia scattered, superficial. Disc buff, flat with a shallow rim when dry, slightly convex without a rim and grey, at least toward the margin, when moist, up to 500μ across. Receptacle disc-like with a broad base and sides almost vertical or slightly sloping inwards to the margin, dark brown or blackish, smooth. Flesh of slender, loosely interwoven, hyaline hyphae. Excipulum of broader, hyaline hyphae radially arranged, the cells becoming isodiametric as they approach the surface. Outermost layer of more or less globose cells with thin, dark brown walls, mostly 6–10μ across, those near the margin of the receptacle somewhat more clavate but not produced into hairs. The hymenium yields a sulphur-coloured solution in 10 per cent. KOH. Asci clavate, narrowed to a stalk below, pointed above with a small pore dark blue in Melzer's reagent, 8-spored, 60–70 × 8–10μ. Ascospores irregularly arranged, fusiform, 3-septate, straight or slightly curved, 19–22 × 2μ (20–28 × 2–3μ according to Karsten). Paraphyses slender, slightly enlarged upwards to about 2μ at the obtuse tip, not longer than the asci.

On decaying culms of *Juncus conglomeratus* ; type, Mustiala, Finland, 30 August 1868.

The fungus is evidently a species of *Belonopsis*.

14.* **Mollisia junciseda** (*Karst.*) *Karst.** **juncinella** (*Karst.*) *Karst*· Mycol. Fenn. **1,** 198 (1871).

Peziza junciseda Karst. **P. juncinella* Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 164 (1869).

Superficially and structurally this closely resembles the above, differing only in its larger asci (70–80 × 8–9μ) and spores (23–27 × 3–3·5μ). Type on *Juncus articulatus* according to the published diagnosis ; the packet in Herb. Karsten is labelled " Ml." (=Mustiala)" ad Junc. Gerardi P.A. Karst. 30 Aug. 1868 ".

15. **Mollisia graminea** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 199 (1871).

Peziza graminea Karst., Fung. Fenn. 747.

Niptera palustris Rob.***** *N. graminea* Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 247 (1870).

Belonopsis graminea (Karst.) Sacc. & Syd., Syll. Fung. **16,** 753, (1902).

Apothecia scattered, superficial. Disc yellowish buff, flat with a low, broad pale rim when dry, slightly convex when moist, up to 1 mm. across. Receptacle saucer-shaped, on a rather narrow base, pale buff at the margin, dark brown below, smooth above but bearing numerous brown anchoring hyphae below. There is no common subiculum but each apothecium is surrounded by a narrow zone of brown radiating hyphae. Flesh of slender, interwoven, hyaline hyphae about 2μ thick. Excipulum 2–3 cells deep formed towards the margin of small, thinwalled, somewhat angular isodiametric, hyaline cells, the outermost often elongated, below of larger rounded cells, 10–15μ across, with thin brown walls, running out into the stout anchoring hyphae 3–4μ wide. Asci cylindric-clavate, indistinctly stalked, narrowed above, the pore deep blue in Melzer's reagent, 8-spored, 70–90 × 8–12μ. Ascospores fusiform, mostly inequilateral, 3-septate, 20–26 × 3μ (20–30 × 3–4μ Karsten). Paraphyses cylindrical, slightly enlarged upwards to 3–4μ at the obtuse apex.

What appears to be the type in Herb. Karsten is labelled :—" *Peziza junciseda* Ml. ad Calamagr. (?) 27 Sept. 68 ", to which has been added " *Belonopsis graminea* (Karst.) Sacc. & Syd. This appears to be a good species of *Belonopsis*, distinct from *Mollisia junciseda.*

16. **Mollisia excelsior** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 199 (1871).

Peziza excelsior Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 165 (1869).

Belonopsis excelsior (Karst.) Rehm in Rabenh. Krypt Flora **1** (3), 572 (1896).

Apothecia scattered or in small groups, superficial. Disc up to 1–2 mm. across, flat and ochraceous buff when dry, greyer and markedly convex when moist. Receptacle concolourous with the disc at the margin, dark brown below, smooth, disc-like with a small base. Flesh of fine, interwoven, hyaline hyphae. Excipulum of similar but light brown hyphae lying parallel and radially arranged, becoming broader towards the surface, until the outermost layer consists of short, clavate, dark brown cells about 10–15 × 8μ. There are no anchoring hyphae. Asci cylindric-clavate with short stout stalk, pore deep blue in Melzer's reagent, 8-spored, 120–130 × 8–10μ. Spores lying parallel in a fascicle, cylindric-clavate, rounded at one end, pointed at the other, usually slightly curved, 3-septate at maturity, 50–80 × 3–4μ. Paraphyses cylindrical, about 1–2 wide, with greatly enlarged obtuse apices 4–7μ wide.

Type, Mustiala, on Phragmites, 11 May 1866.

It is noteworthy that this packet bears the following measurements : "Asc. 130–140–150 long. 9–10½ lat. sp. 56–80 long. 3½–2½, p. 1·5 clav. 5–6μ." These are correct but the published spore size was 42–50 × 3–4μ.

This is the type species of *Belonopsis.*

17. **Mollisia rhinanthi** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 200 (1871).

Trochila rhinanthi Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 246 (1870).

Pseudopeziza rhinanthi (Karst.) Sacc., Syll. Fung. **8,** 358 (1889).

Apothecia scattered, erumpent, seated on the xylem and surrounded by torn strips of cortical and epidermal tissue. Disc deeply concave, dark grey or nearly black, up to 1·5 mm. across. Receptacle cupshaped on a broad base, the margin incurved, angular when dry, smooth. Hypothecium thin, of slender, interwoven, hyaline hyphae. Excipulum on the flanks of the receptacle formed of 2–3 layers of dark brown, thinwalled cells, usually somewhat angular by mutual pressure, isodiametric below, more elongated and clavate towards the margin. At the base of the receptacle the inner excipular layers, sharply defined from the hypothecium, are of hyaline, thin-walled, isodiametric cells about 10μ across, while only the outermost layer is dark-walled. Asci cylindric-clavate, tapering below but not distinctly stalked, about 70 × 6–7μ, narrowed above to the small pore, which stains deep blue in Melzer's reagent, 8-spored. Ascospores 2 or even 3-seriate, clavate, rounded above with a long, tapering lower portion, 1-septate, 10–25 × 1·5–2·5μ. Paraphyses very slender, cylindrical.

Type, on dead stems of *Rhinanthus*, Mustiala, Finland, 20 July 1869.

The type collection is extremely scanty but appears to lack the black stroma characteristic of *Ephelina lugubris* (de Not.) von Höhn. on the same host. There is also in Herb. Karsten a collection labelled " Mollisia pa Rhinanthus, Mustiala, 18.5.1872 " which is evidently *Ephelina lugubris.* This has the black stroma and much shorter, clavate ascospores, about 10–12 × 3μ, often appearing 1-septate. *M. rhinanthi* may be a good species but one would like to see more and better collections to demonstrate that it is not merely a state of *E. lugubris* developed on the upper part of the stems instead of at the crown.

18.* **Mollisia atrata** (*Pers.*) *Karst.** **M. foliicola** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 201 (1871).

Trochila atrata (Pers.) Karst.* *Tr. foliicola* Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 244 (1870).

Mollisia foliicola (Karst.) Karst. in Acta Soc. Fauna Flora Fenn. **2,** (6), 136 (1885).

Pyrenopeziza foliicola (Karst.) Sacc. Michelia I p. 65, 1877.

This species has been fully redescribed and figured by Nannfeldt. It is a good *Pyrenopeziza*, of which I have seen and compared with the type the following British collection :—On decaying leaves of *Alnus*, Llwynywormwood House, Llandovery, 30.IV.1948. The species may well be common on that substrate but is likely to be overlooked because of its minute size.

18.** **Mollisia atrata** (*Pers.*) *Karst.*** **M. kolaensis** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 201 (1871).

Peziza kolaensis Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 191, (1869).

Pyrenopeziza kolaensis (Karst.) Sacc., Syll. Fung. **8,** 370 (1889).

Apothecia scattered, appearing superficial but actually erumpent. Disc dark grey, deeply concave, about 300μ across. Receptacle cup-shaped with a broad base, minutely downy throughout, concolorous with a paler margin. Flesh of hyaline, rather thick-walled, closely interwoven hyphae about 3–4μ thick, continuous with a small stromatic hyphal web immersed in the substrate. There is a thin but well defined subhymenial layer of more slender, thinwalled hyphae. Excipulum of parallel hyphae 4–5μ across, lying at a low angle to the surface, with thin dark brown walls and cells about 8–10μ long. These run out into short, septate, brown hairs, those toward the margin longer, up to 35×4μ, paler, cylindrical with rounded tips, their walls covered with minute granules. Asci cylindrical, sessile, rounded above, the pore *not* blue in Melzer's reagent, 8-spored, 25–30×4–5μ. Ascospores narrowly fusiform, 5–8×1.5μ. Paraphyses slender, cylindrical, about 1·5μ wide, not longer than the asci. (Fig. 7).

Type on bark of *Salix*, Kola, 20 July 1861.

This is evidently a species of *Cistella* in the sense of Nannfeldt (1932).

19. **Mollisia galii-veri** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 203 (1871).

Trochila atrata (Pers.) Karst.***** *Tr. galii* Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 245 (1870).

Pyrenopeziza galii-veri (Karst.) Sacc.; Syll. Fung. **8,** 356 (1889).

This fungus has been redescribed and figured by Nannfeldt (1932) and is a good species of *Pyrenopeziza*.

20. **Mollisia leucostoma** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 203 (1871).

Trochila leucostoma Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 245 (1870).

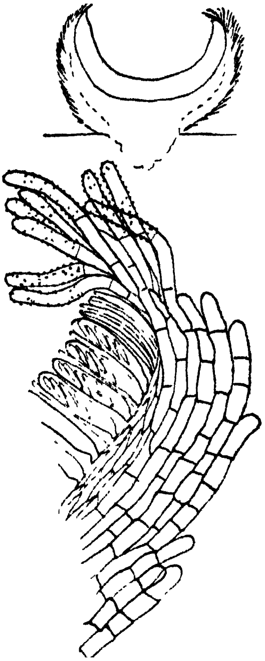

FIG. 7. *Mollisia kolaensis*. Vertical section of apothecium × 50. Section through apothecial margin × 500.

Niptera leucostoma (Karst.) Sacc., Syll. Fung. **8,** 483 (1889).

Pyrenopeziza leucostoma (Karst.) Nannf. in Nov. Act. Reg. Soc. Sci. Upsal. Ser. 4, **8,** 153 (1932).

This species has been full redescribed and figured by Nannfeldt (1932) and was justly referred by him to *Pyrenopeziza*.

22. **Mollisia thallophila** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 205 (1871).

Trochila thallophila Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 246 (1870).

Pyrenopeziza thallophila (Karst.) Sacc., Syll. Fung. **8,** 370 (1889).

Apothecia scattered, erumpent from thallus and apothecia of *Lecanora subfusca*. Disc concave, black, with inrolled margin, up to 400μ across. Receptacle cupshaped, very dark grey, ridged and furrowed vertically when dry, margin paler and often lobed, seated on a small peg-like base inserted in the lichen tissue. Flesh thin, of compact, slender, hyaline hyphae. Excipulum 2–3 cells thick, of thin-walled, more or less rounded brown cells, 6–8μ across, turning deep red-brown in Melzer's reagent, running out into unicellular, onion-shaped hairs, 15–20μ long × 5μ at the base, especially numerous near the margin. Asci cylindric-clavate, short-stalked or almost sessile 30–40 × 7μ, rounded above, the pore *not* stained blue in Melzer's reagent, 8-spored. Ascospores biseriate, elliptical or somewhat clavate, 7–10 × 2·5–3μ. Paraphyses slender, cylindrical, about 1·5 thick. (Fig. 8). There are two packets of this species in Herb. Karsten :—" Mustiala, ad Aln. inc. 12 Dec. 1869 " and " 24 Aprilis 1869 ". The former is the better material and is that described above. Nannfeldt (1932) thought the apothecia originated from the underlying wood and that their association with the lichen was accidental. Study of microtome sections suggests that they are parasitic on the lichen as Karsten believed. The systematic position of this peculiar species is uncertain. Nannfeldt (1932 p. 139 footnote) rejected it from *Pyrenopeziza* and tentatively assigned it to *Hyaloscypha*. The onion-shaped hairs would suit this ascription but most species of *Hyaloscypha* are light-coloured.

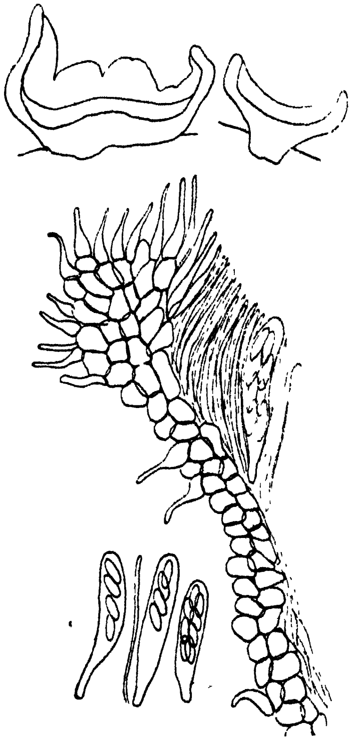

FIG. 8. *Mollisia thallophila.* Vertical sections of 2 apothecia × 50. Section through apothecial margin, asci and paraphysis × 500.

26.* **Mollisia fusca** (*Pers.*) *Karst.** **M. evilescens** (*Karst.*) *Karst.*, Mycol. Fenn. **1,** 208 (1871).

Peziza evilescens Karst. in Not. Sallsk. Fauna Flora Fenn. **10,** 156 (1869).

Trochila fusca (Pers.) Karst.* *Tr. evilescens* (Karst.) Karst. in Not. Sallsk. Fauna Flora Fenn. **11,** 244 (1870).

Tapesia evilescens (Karst.) Karst. in Acta Soc. Fauna Flora Fenn. **2** (6), 137 (1885).

Apothecia scattered, superficial, seated on a conspicuous, blackish, subicular web. Disc almost black, concave when dry, flat when moist, up to 1 mm. across. Receptacle cupshaped and contracted when dry, saucer-like on a broad base rather loosely attached to the substrate when moist, dark grey, paler at the margin, smooth. Flesh white, of slender, hyaline hyphae, becoming parallel laterally and passing imperceptibly into the inner layers of the excipulum. Excipulum of radially arranged, rectangular or rounded, thinwalled cells, about 10–12μ across, the inner layers almost colourless, the outermost dark brown, globose below, elongated and rectangular towards the margin. Subicular hyphae dark-brown, thinwalled, rather sparingly septate, about 3–4μ wide, arranged in an angular meshwork of strands composed of 1–2 hyphae. Asci cylindric-clavate, no longer easily separated but 45×5μ according to Karsten. Ascospores fusiform 5–10×1–1·5μ. Paraphyses not seen.

On dead culms of grasses, the type on *Calamagrostis*, Mustiala Finland, 4 August 1869.

This species is evidently quite distinct from *Tapesia fusca* (Pers. ex Fr.) Fuckel.

TWO NEW SPECIES OF ISCHAEMUM.

N. L. Bor.

In the folders of the genus *Ischaemum* at Kew are a number of sheets which the late Dr. Stapf considered to be new species. These have not, hitherto, been published, and the omission in now remedied.

Ischaemum lacei *Stapf* mss. sp. nov., *I. aristato* Linn. affine, sed ab eo alis spicularum sessilium angustioribus racemis brevioribus distinguendum.

Gramen perenne usque 120 cm. altum. *Culmi* erecti vel geniculatim ascendentes, ramosi, laeves glabrique, nitentes, infra nodos striati, nodis barbati. *Foliorum laminae* usque 17 cm. longae, 15 mm. latae, basi apiceque attentuatae, anguste ellipticae, utrimque densis pilis albis e tuberculis ortis praeditae, marginibus cartilagineis scabrae, in apicem crassum validum attenuatae ; nervus medius prominens, albus ; *vaginae* laxiusculae, plerumque nodis breviores, compressae, striatae, dense pilosae praecipue superne pilis albis e tuberculis ortis, fauci barbatae ; *ligula* oblonga, superne lacerata, ad 5 mm. longa.

Racemi bini-5–6 cm. longi ; spicula sessilis cum spicula pedicellata ad quemvis rhacheos fragilis nodum ; spicula pedicellata ab pedicello soluta, spicula sessilis cum articulo pedicelloque demum disjungens ; articuli 4·5 mm. longi, sectione triangulares, laeves glabrique, angulis longe ciliati (pili usque 2 mm. longi) ; pedicelli articulis similes, aequilongi. *Spiculae* (cum callo barbato 1 mm. longo) 10·5 mm. longae. *Spicula sessilis* ; *gluma inferior* 8 mm. longa, lanceolata vel ovata, superne bialata, dorso rotundata, explanata latissime ovata, apice emarginata, superne margines anguste involutae, media parte dense pilosa ; *gluma superior* 10–10·5 mm. longa, explanata lanceolata, 3-nervis, dorso carinata, dimidia parte superiore alata, carina infra alam barbata, minute bifida ; *arista* scabra, 2·5 mm. longa. *Anthoecium inferum* ♂; *lemma* 6 mm. longum, elliptico-acutum, hyalinum, 3-nerve ; palea aequilonga, 2-nervis. *Anthoecium superius* ⚥ ; *lemma* 6·5 mm. longum, 3-nerve, ad medium fissum, ex fissura aristam emittens ; *arista* circiter 2 cm. longa ; *columna* 11 mm. longa, brunnea, torta. *Spicula pedicellata* ; *gluma inferior* 8 mm. longa (cum callo 1 mm. longo), valde compressa, carinata, carina late alata (ala serrata, lata, purpurea, margine lutea) dorso lateribusque pilosa, brevissime aristata ; *gluma superior* 7·5 mm.

longa, dorso plana vel rotundata, superne carina alata, dorso scabra, medio pilosa *Anthoecia superiora* inferioraque eis spiculae sessilis similia sed minora ; arista 11 mm. longa.

BURMA. Amherst, Daiona Range, Muleyit Peak 2000 m., 27 Jan. 1912, *J. A. Lace* 5627 (Typus in Herb. Kew.) ; Mogok, Shwe-u-daung Reserve, 20 Dec. 1931, *R. N. Parker*.

Ischaemum duthiei *Stapf* mss., sp. nov., *I. nilagirico* Hack. et *I. hirto* Hack. simile sed ab illo spiculis minoribus, lemmate spiculae pedicellatae inferiore acuminata vel aristato, ab eo racemis numerosis (3–5) distinguitur.

Gramen perenne. *Culmi* usque 80 cm. alti, ramosissimi, laeves glabrique, nitentes, nodis dense albo-barbati, vaginis saepius omnino tecti, infra racemos longe-nudi. *Foliorum laminae* usque 20 cm. longae, 2 cm. latae, basi attenuatae, apice acuminatae, utrimque pilis mollibus longis albis appressis tectae vel supra glabrae, marginibus scabrae, ascendentes haud patentes, eae vaginarum superiorum vestigiales ; *vaginae* inferiores laxiusculae, superiores culmos complectentes, pilis mollibus longis albis tectae, inferne demum glabrae ; *ligulae* membranaceae, 2·5–3 mm. longae.

Racemi 3–5, digitati, 3–7 cm. longi. *Spiculae* ad quemvis rhacheos nodum binae, pedicellata a pedicello demum soluta, sessilis demum cum rhacheos articulo accumbente disjungens ; articuli 2 mm. longi, sectione triangulares, angulis pilis longis albis ciliati, ceterum glabri ; pedicelli articulis aequilongi. *Spicula sessilis* callo stipitato 1 mm. longo insidens ; callus pilis longis albis barbatus ; *gluma inferior* 4–5·5 mm. longa, lanceolata, bicuspidata, superne bicarinata, in parte dimidia inferiore coriacea, glabra, nitens, laevis, in dimidia parte superiore herbacea, multinervis, pilis parcis albis tecta vel glabra, superne carinis scabra, apice in 2 lobos breves acuminatos fissa ; *gluma superior* 4–5 mm. longa, lanceolato-acuminata, dorso inferne rotundata, superne compressa, carinata, 5-nervis, carina anguste alata, dorso laevis glabraque, brevissime aristata. *Anthoecium inferius* ♂ vel vacuum ; *lemma* 3·5 mm. longum, elliptico-acutum ; *palea* similis, aequilonga, 2-nervis ; *stamina* 3 ; *antherae* 2·5 mm. longae. *Anthoecium superius* ☿ ; *lemma* 3·5 mm. longum, hyalinum, ad medium fissum, 2-lobatum, ex fissura aristatum ; palea aequilonga, lanceolata, hyalina ; *arista* 7–8 mm. longa ; *stamina* 3 ; *antherae* 2·5 mm. longae. *Spicula pedicellata* ; *gluma inferior* 4·5 mm. longa, explanata lanceolato-acuta, compressa, carinata, dorso pilis albis longis tecta, multinervis ; *gluma superior* navicularis, 4·5 mm. longa, dorso inferne rotundata, superne carinata, pilis longis albis praecipue carina tecta, brevissime aristata. *Anthoecium inferius* ♂ ; *lemma paleaque* eis spiculae sessilis similes sed breviores ; *stamina* 3 ; *antherae* 2 mm. longae. *Anthoecium superius* ☿ ; partes omnes eis spiculae sessilis similes.

INDIA. Central Provinces : Pachmari, 24 Feb. 1841, *J. F. Duthie* 10623 " by streams " ; Chota Nagpur, Liohardugga 19 Oct. 1883, 700 m., *C. B. Clarke* 33875A. Bihar : Neterhat, 1000 m., Oct. 1918, *H. H. Haines* 5856, " along streams " (Typus) ; Singbhum, Nov. 1898, *H. H. Haines* 128. Bengal : Western Bengal and Behar, Herb. Sulpiz Kurz.

NOTES ON CYPERACEAE : XXIV.*

E. NELMES.

New and Other Interesting Malaysian Carices, mostly from the Leiden and Buitenzorg Herbaria.

Notes XXII and XXIII were concerned with the Brass and Clemens New Guinea *Carices* respectively. They were written as part of the preliminary work of a revision of the Malaysian *Carices*, and the same is true of this Note, which describes the results of the examination of the very large *Carex* collections in the Leiden and Buitenzorg herbaria.

The main contents of this paper are descriptions of new species and varieties, but there are also notes referring to *Carices* new to Malaysia, to a few long-standing misidentifications, and to newly discovered extensions of range. I also venture to record those of my determinations which differ from Dr. Kükenthal's, as published in Bull. Jard. Bot. Buitenzorg, sér. 3, 16: 313–322 : 1940. In this important paper he was dealing with various gatherings, but especially with a large collection of *Cyperaceae* made by Dr. van Steenis in Atjeh, Sumatra, in 1937. I regret to say that I have not seen some of these van Steenis numbers, including the whole material published of *Carex semiglomerata* Kükenth. and *C. vansteenisii* Kükenth., which are apparently not represented in either the Leiden or the Buitenzorg herbarium. They may have been destroyed in Germany during the late war.

Carex helferi *Boeck.* in Linnaea, 40 : 365 : 1876.

JAVA : Waterfall, November, ex Herb. *Reinwardt.*

Considerably smaller vegetatively than the only other specimens of this species hitherto known, from Lower Burma and Siam, but closely agreeing with them in glume and fruit characters. This is the first and only record from the Flora Malesiana area of any of the very wide-leaved (up to 3 cm. or more) *Carices*, which are mainly confined to Indo-China.

C. perakensis *C. B. Clarke* in Hook f. Fl. Brit. Ind. 6 : 720 : 1894.

[*C. nodiflora* (non Boeck.)—Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, 16 : 316 : 1940.]

SUMATRA : Atjeh ; Gajolanden, Poetjoek Agoesan, forested crest above Penosan, 1600 m., 27 Jan. 1937, *van Steenis* 8277.

C. nodiflora is quite specifically distinct from *C. perakensis* and is endemic in the Philippines.

C. perakensis *C. B. Clarke.*

C. vansteenisii Kükenth. var. *brevispiculosa* Kükenth. l.c. 321.

SUMATRA : Atjeh ; Kapiterreinen, swamp at the confluence of the rivers Kapi and Aoenan, 1100–1250 m., 21 March 1937, *van Steenis* 9934.

As mentioned above, I have not had a chance of seeing *C. vansteenisii* itself. From its description I am inclined to think it may well be a distinct and interesting species .

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*Continued from K.B. 1949, 392.

Kjellberg 1479, collected in Celebes, 28 May 1929, and placed tentatively by Kükenthal under his *C. pseudo-rivulorum* (l. c. 320) also belongs, I think, to *C. perakensis*, but the specimen seen is poorly developed.

C. ?tonkinensis *Franch.* in Nouv. Arch. Mus. Hist. Nat. sér, 3, 8 : 251 : 1896.

[*C. pseudo-rivulorum* (non Kükenth.)—Kükenth. l.c. 319.]

SUMATRA : East Coast ; Dolok Singgalang, north of Toba lake, 1700 m., 25 May 1922, *Lörzing* 8874.

BORNEO : British North Borneo ; Mt. Kinabalu, on Penataran river, 2550 m., 21 June 1933, *Clemens* 33652.

I have not seen the other specimen cited as *C. pseudo-rivulorum* by Kükenthal from Sumatra (Atjeh, 15 Feb. 1937, *van Steenis* 8783).

C. tonkinensis is a species which has not yet been clearly distinguished from *C. perakensis*, and these Sumatran and Bornean plants may possibly represent an undescribed species.

C. tricephala *Boeck.* in Flora, 58 : 263 : 1875. Madura.

C. madoerensis C. B. Clarke in Journ. Linn. Soc. 37 : 15 : 1904.

C. thorelii E. G. Camus in Lecomte, Not. Syst. 1 : 295 : 1910. Indo-China.

C. plesiocephala Turrill in Kew Bull. 1910 : 385 : 1910. Siam, Upper Burma.

When I made my Key to the *Carices* of Malaysia I had not seen the type of *C. tricephala* (*Zollinger* 1778), and I kept this species separate from *C. thorelii* (*C. plesiocephala*). Their descriptions did not entirely agree with each other, and their distributions also indicated different species. I have now seen Zollinger's plant, which is the type of both *C. tricephala* and *C. madoerensis*, and it is undoubtedly the same species as *C. thorelii*, from Burma, Siam, and Indo-China. Mr. Airy Shaw has pointed out that the distribution is somewhat similar to that of the teak tree, *Tectona grandis* L.

It may be of interest to mention here that included in the Buitenzorg *Carex* loan was a specimen in spirit labelled " C. ovata. Java. Backer 20462 ". It presumably purports to be a specimen of Burman's *C. ovata*, which is probably a species of *Cyperaceae* but almost certainly not a *Carex*, as Burman, Dr. van Steenis tells me, collected only in coastal areas in Malaysia, where unispicate *Carices* do not grow. The specimen in spirit is a single spike taken, as I think, from a plant of *C. tricephala.*

C. horsfieldii *Boott* var. **major** *Nelmes*, var. nov. ; a typo glumis majoribus, utriculis multo longioribus substrictis, achaeniis majoribus differt.

MOLUCCAS : Tenimber Islands (Timor Laut), P. Jamdena, Otimmer, primary forest, low altitude, 28 March 1938, *Buwalda* 4469 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

The much larger and straighter utricles than those of the species give this local plant a quite distinctive appearance.

C. stramentitia *Boott ex Boeck.* in Linnaea, 40 : 351 : 1876.

JAVA : Batavia ; Krawang, Palered, near Poerwakarta, 20 Oct. 1924, *Bakhuizen van den Brink* 6565.

New for Malaysia. Not previously known south of Upper Burma. The Java plant is rather more robust, and more bristly below the nodes, than Indian specimens, and its utricles have a more pronounced spongy base.

Carex buennemeijeri *Nelmes*, sp. nov. ; affinis *C. semiglomeratae* Kükenth., sed foliis latioribus, inflorescentiis latioribus, glumis brevioribus semper glabris pallidioribus apice magis obtusis, utriculis subinflatis distincte nervosis, rostris brevioribus differt.

Caespitosa. *Rhizoma* descendens, crassum, lignosum. *Culmi* erecti sed apice fortasse subcernui, trigoni, angulis plerumque acuti, 110–150 cm. alti, inferne 3–4 mm. crassi, laeves. *Folia* basilaria et subbasilaria, et 1–2 caulina, longa sed culmum non excedentia, 9–15 mm. lata, plana vel planiuscula, interdum tenuiter septato-nodulosa, supra superne scabrida ; *vaginae* atro-rubidae dorso inferne rubidinerves. *Inflorescentia* composite continua vel interrupte paniculata, 50–70 cm. superiores culmorum occupans ; *paniculae secundariae* 8–10, plerumque binae, infimae plerumque singulae, oblongae vel lanceolatae, 4–12 cm. longae, 1–3·5 cm. latae, subdensae vel densae, ramulis patulis, inferioribus iterum in spicas simplices ramosis, spicis patulis vel patentibus, paniculae inferiores distantes vel remotae, superiores subapproximatae vel subdistantes, inferiores longe vel longissime, superiores vix vel longe, exserte pedunculatae ; *pedunculi* trigoni vel compressi, subtenues, angulis acuti hispiduli. *Rhachis* inferne laevis, superne et rhachis panicularum secundariarum hispidula. *Bracteae* foliaceae sed superiores redactae, inferiores culmo breviores, superiores eas aequantes vel leviter excedentes, inferiores longe vel longissime, superiores breviter vel longe, vaginantes ; *vaginae* glabrae, ore membranaceae brunneae hispidulae, nodis aureae vel aureo-brunneae. *Spicae* numerosae, androgynaeceae, 3·5–6 mm. longae, subdensiflorae, sessiles, parte mascula parti femineae subaequilonga. *Bracteolae* glumiformes, parvae, hispidulae, breviter vel longe aristatae. *Cladoprophylla* utriculiformia. *Glumae femineae* ovatae cymbiformes, apice plerumque obtusae vel rotundae sed interdum subacutae seape eroso-ciliatae, 1·5–2 mm. longae, 1–1·4 mm. latae, translucentes, glabrae, pallidae vel albidae, lineolis parvis rubidis maculatae, nervosae, vitta mediana trinervi nervis superne coalitis ex apice inferne plerumque excurrente ; *arista* laevis vel marginibus minute hispidula, usque 0·25 mm. longa. *Utriculi* plus minus ellipsoidei, obtuse trigoni, demum subinflati, 2·5–3·25 mm. longi, circiter 1 mm. lati, membranacei, valde plurinerves, nervis 1–2 in media facie dorsali demum incrassatis sulcum medianum efficientibus, glabri vel interdum in facie ventrali apice parce setulosi, vix vel angustissime marginati, stricti vel subcurvati, virides, rubido-maculati, demum fulvi vel brunnei, basi spongioso-incrassati, haud stipitati, subsensim vel subabrupte rostrati ; *rostrum* plano-convexum, vix vel sensim acuminatum, 1–1·25 mm. longum, marginatum, marginibus parce hispidulum, bidentatum ; *os* haud obliquum : *dentes* 0·2–0·4 mm. longi, stricti. *Achaenium* ellipsoideum vel oblongo-

ellipsoideum, trigonum, 1·5–1·75 mm. longum, 0·8–0·9 mm. latum, haud stipitatum, abrupte brevissime leviter bulbose saepe inflexe rostratum. *Stylus* basi subincrassatus. *Stigmata* 3.

SUMATRA : Mt. Singgalang, underwood, common, ± 1300 m., 25. May 1918, *Bünnemeijer* 2530 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.) ; Mt. Merapi, in forest by river, 1400 m., 16 Sept. 1918, *Bünnemeijer* 4651 ; Sinaboeng, north slopes, primitive forest, in lightish places, widespread, ± 1550 m., 19 Jan. 1921, *Lörzing* 8223 ; Berastagi, rainforest, in lightish places, common, 1600 m., 9 Dec. 1928, *Beumée* A818.

MOLUCCAS : Ceram ; Middle Ceram, Central Mountains, Gunung Hale, 1000 m., May–Aug. 1911, *Stresemann* 160 ; West Ceram, Salahóea-Toplána-Meóte-Honitétoe, 1160 m., 31 Jan.–2 Feb. 1938, *Eyma* 2725.

Besides its obvious affinity with *C. semiglomerata* Kükenth., this species, through its stoutly-nerved utricles, bears some relationship to *C. cruciata* Wahlenb. and its allies.

Carex oblonga *Nelmes*, sp. nov. ; affinis *C. rafflesianae* Boott, sed foliis angustioribus, paniculis secundariis minoribus oblongis, glumis majoribus apice obtusis, utriculis majoribus fusco-rubidis, rostris longioribus, achaeniis majoribus differt.

Caespitosa. *Rhizoma* breve, lignosum, squamis vaginatis fusco-rubidis vel fibrillosis vestitum. *Culmi* plus minus erecti, trigoni, 47–127 cm. alti, inferne 1–1·5 mm. crassi, usque ad partem rhacheos superiorem laeves. *Folia* subbasilaria, interdum 1–2 in caule superne sita, inferiora pauca ad vaginas atro-rubras redacta, circa basin culmi interdum ut fibrilli fusco-rubidi persistentia, culmum plerumque aequantia, 3–7 mm. lata, plana vel revoluta, subcoriacea, inferne laevia, supra superne scabro-vesiculosa ; *vaginae* foliorum subbasilarium rubidae, demum in fibris reticulatim fissae. *Inflorescentia* composite interrupte paniculata, 15–33 cn. superiores culmorum occupans ; *paniculae secundariae* 4–5, singulae erectae vel plus minus cernuae, 2·5–7·5 cm. longae, 8–13 mm. latea, plus minus oblongae, superiores approximatae vel subapproximatae, fastigiatae, inferiores distantes ve lremotae, vel unispicatis vel inferioribus in spicas 2–5 simplices ramulosis, paniculae superiores vix vel breviter, inferiores longe vel longissime exserte pedunculatae ; *pedunculi* trigoni vel compressi, graciles, inferne laeves, superne hispiduli. *Rhachis* panicularum secundariarum plerumque angulis hispidula. *Bracteae* foliaceae sed superiores multo redactae, inflorescentias subaequantes inferiores longe superiores breviter vaginantes ; *vagiane* plus minis hispidulae. *Spicae* subnumerosae, androgynaeceae, sessiles, subdensiflorae, 4–7 mm. longae, parte mascula parti femineae aequilonga, pauciflorae. *Bracteolae* glumiformes, plus minus oblongae, apice rotundatae, 1 mm. longae, hispidulae ; *arista* stricta vel flexuosa, hispidulo-marginata, plerumque longa. *Cladoprophylla* superne utriculiformia, superne glumiformes, circiter 2 mm. longa. *Glumae femineae* ovatae vel oblongo-ovatae, cymbiformes, apicep lerumque obtusissimae, 2–2·75 mm. longae, 1·5–2 mm. latae, translucentes, glabrae vel infima interdum parce hispidula, nervosae, vitta mediana trinervi, nervis superne coalitis, ex apice plerumque excurrente ; *arista* laevis vel ciliolato-hispidula. *Utriculi* ellipsoidei vel oblongo-ellipsoidei, trigoni vel compressi, 4–4·5 mm. longi, 1–1·25 mm. lati, subcoriacei, multinerves, inferne glabri, superne pallide subadpresso-setulosi, marginati, stricti vel interdum leviter recurvati vel reflexi, inferne straminei, superne rubri vel atro-rubidi, demum patuli, vix stipitati, sensim rostrati ; *rostrum* acuminatum, compresso-trigonum, 1·25–1·5 mm. longum, bidentatum ; *dentes* 0·25–0·5 mm. longi, stricti : *os* strictum vel leviter dorsaliter obliquum. *Achaenium* oblongo-ellipsoideum, trigonum, faciebus inferne concavum superne planiusculum, brevissime stricte vel leviter reflexo-stipitatum, abrupte rostratum. *Stylus* vix basi incrassatus. *Stigmata* 3.

CELEBES : South-West Celebes ; Lombasang, forest, ± 950 m., 20 April 1921, *Bünnemeijer* 11084 ; Mt. Bonthain, north-west slope, forest, ±2200 m., 6 June 1921, *Bünnemeijer* 11858B (flowering) ; ibid., ± 2450 m., 8 June 1921, *Bünnemeijer* 11972 (fruiting, typus, Herb. Kew.; dupl., Herb. Hort. Bogor.).

Its narrow leaves and oblong and comparatively small secondary panicles give this species a very different appearance from its nearest relative, *C. rafflesiana* Boott.

Carex ceramica *Nelmes*, sp. nov. ; affinis *C. sarawaketensi* Kukenth., sed paniculis secundariis paucis singulis, utriculis dense hispidulis, ventre paucinerviis, rostro longioribus differt.

Vix caespitosa. *Rhizoma* stoloniferum, horizontale vel descendens, squamis vaginatis fuscis vel atro-rubris vestitum, demum fibrillosis. *Culmi* erecti vel subcurvati, trigoni, 30–50 cm. alti, 1–1·25 mm. crassi, laeves. *Folia* subnumerosa, basilaria vel subbasilaria, 1 vel plures in caule superne sita, culmo breviora, 4–6 mm. lata, planiuscula ; *vaginae* foliorum basilarium rubidae vel atro-rubrae, demum fibrillosae. *Inflorescentia* composite interrupte anguste paniculata, 10–20 cm. superiores culmorum occupans ; *paniculae secundariae* 4–5, singulae, erectae vel suberectae, oblongae, oblongo-lanceolatae, vel subpyramidales, 3–7 cm. longae, 1–2·5 cm. latae, inferiores approximatae, inferiores distantes, subdensae, ramis omnibus spicas simplices sistentibus vel inferioribus in spicas simplices 2–5 ramulosis, paniculae inferiores longe, superiores vix vel breviter, exserte pedunculatae ; *pedunculi* acute trigoni, tenues, angulis hispiduli. *Bracteae* foliaceae sed superiores minores, culmum aequantes vel eo breviora, superiores breviter inferiores longe vaginantes ; *vaginae* glabrae vel suprema hispidula. *Spicae* numerosae, androgynaeceae, 6–13 mm. longae, plerumque laxiflorae, suberectae vel patulae, sessiles, parte mascula quam pars feminea breviore vel multo longiore. *Bracteolae* glumiformes, muticae vel longiaristatae. *Cladoprophylla* inferne utriculiformia, superne glumiformia. *Glumae femineae* ovatae vel triangulari-ovatae, cymbiformes, apice acutae vel obtusae, 1·75–3 mm. longae, 1·5–2 mm. latae, translucentes, inferiores hispidulae, superiores parce hispidulae vel glabrescentes, enerves vel tenuissime nervosae, castaneae, marginibus superne anguste albo-hyalinae, vel inferne castaneae et superne omnino albidae, nervo mediano plerumque apicem non attingente, interdum excurrente ; *arista* marginibus hispidula, usque 0·75 mm. longa. *Utriculi* ellipsoidei, obtuse trigoni, faciebus planiusculi, 3·5–4 mm. longi, 0·8–0·9 mm. lati, submembranacei, plurinerves, anguste marginati, plerumque basi excepta dense albido-vitreo-hispidi, interdum facie dorsali glabri vel glabrescentes, stricti vel subrecurvi, demum patuli, basi pallida excepta fusco-rubidi, vix spongioso-stipitati, subsensim vel sub-

abrupte rostrati ; *rostrum* plano-convexum, 1·75–2 mm. longum, vix acuminatum, anguste marginatum, hispidulum, bidentatum ; *os* dorso perobliquum ; *dentes* subbreves, apices albo-hyalini, demum erosi. *Achaenium* ellipsoideum vel oblongo-ellipsoideum, trigonum, 1·75–2mm. longum, 0·75–0·9 mm. latum, brevissime reflexe interdum torte rostratum. *Stylus* vix basi incrassatus. *Stigmata* 3.

MOLUCCAS : Ceram ; Middle Ceram, Gunong Pinaia, ± 2860 m., "Mattenregion" of the west peaks, on the crest, end of Aug. 1911, *Stresemann* 253 (typus, Herb. Lugd.-Bat. ; dupl., Herb. Kew.) ; ibid., ± 2750–3000 m., *Stresemann* 275.

The long beak of the utricle distinguishes this species sharply from *C. sarawaketensis*, to which and to *C. gembolensis* C. B. Clarke it is closely akin.

C. gembolensis *C. B. Clarke* var. **crebra** *Nelmes*, var. nov. ; a typo paniculis secundariis densissimis, glumis apice acutioribus, utriculis ovoideo-ellipsoideis obscure nervosis differt.

LESSER SUNDA ISLANDS : Flores ; Geli-Mortoe, summit, open stony crater-field (Solfatara-dump), generally scattered, ± 1580 m., 4 Nov. 1932, *Posthumus* 3037 ; Flores, 30 July 1933, *de Voogd* 1830 (typus, Herb. Lugd.-Bat. ; fragm., Herb. Kew.).

Though the very dense panicles of this plant give it a different facies, it is essentially similar to the species.

C. filicina Nees var. ***zipelii** Nelmes, var. nov. ; a typo foliis angustioribus, paniculis secundariis minoribus singulis, glumis ovato-triangularibus aristatis differt.

NEW GUINEA : On rocks, "ex Herb. *Zippelius" (typus, Herb. Kew.).

This specimen seems to be a depauperate one. If not it may represent a species between *C. filicina* and *C. papuana* Nelmes.

var. **angustifolia** *Nelmes*, var. nov. ; a typo culmis minoribus, foliis angustioribus, utriculis minoribus differt.

PHILIPPINE ISLANDS : Luzon ; Tayabas, Mt. Banahao, 2200 m., 22 June 1904, *Klemme* (For. Bur. No. 866) ; ibid., Oct. 1904, *Whitford* 949 ; Benguet ; Pauai, mossy forest, 2200 m., *Merrill* 4743 ; Laguno ; Mt. Banajao, Feb. 1911, *Merrill* 7496 ; Rizal ; Sept. 1915, *Ramos* (But. Sci. No. 23855). Mindanao ; Zambanga, Nov.-Dec. 1911, *Merrill* 8208. Negros ; Caulaon Volcano, ± 1800 m., April 1910, *Merrill* (typus, Herb. Kew.).

It is very probable that this variant of *C. filicina* occurs in other parts of Malaysia.

C. baccans *Nees* in Wight, Contrib. Bot. Ind. 122 : 1834.

C. javanica Boeck. Cyp. Nov. 1 : 43 : 1888.

JAVA : Preanger ; Megamendon, 1350 m., 4 June 1875, *O. Kuntze* 4790.

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*The spelling of this name is with one 'p' (see de Wit in Fl. Mal. sér. 1, 42, cvIII.

Kükenthal (Engl. Pflanzenr. 1909) includes this plant under *C. walkeri* Arn. ex Boott, Subgen. *Eucarex* Coss. et Germ. Through the courtesy of Dr. Merrill and the New York Botanical Garden I have seen the type of *C. javanica*, and though the inflorescences are very young I feel sure that the species is *C. baccans* Nees, Subgen. *Indocarex* Baill.

C. myosurus *Nees* var. **celebica** *Nelmes*, var. nov. ; a typo spicis brevioribus, interdum fere omnino masculis, glumis femineis brevioribus, utriculis angustioribus magis distincte nervosis sensim rostratis differt.

CELEBES : South-West Celebes ; north-west side of Mt. Bonthain, ± 1450 m., 18 May 1921, *Bünnemeijer* 11630 ; ibid., Mt. Bonthain, ± 1700 m., 19 June 1921, *Bünnemeijer* 12343 (typus, Herb. Lugd.-Bat.) ; ibid., ± 1850 m., 21 June 1921, *Bünnemeijer* 12410.

In spite of its distinct general appearance, this plant does not differ essentially from its species. *C. myosurus* itself has not been found south of Lower Burma. This Burma plant was misidentified by C. B. Clarke (Fl. Brit. Ind. 6 : 724 : 1894) as *C. composita* Boott.

C. verticillata *Zoll. et Mor.* var. **havilandii** (*C. B. Clarke*) *Nelmes*, comb. nov.

C. havilandii C. B. Clarke in Journ. Linn. Soc. 37 : 13 : 1904. British North Borneo, *Haviland* 1403.

C. hypsophila Miq. var. *havilandii* (C. B. Clarke) Kükenth. in Engl. Pflanzenr. IV, 20 : 546 : 1909.

It has been generally overlooked that *C. verticillata* Zoll. et Mor. is an earlier and apparently the correct name for the species hitherto known as *C. hypsophila* Miq.

C. verticillata *Zoll. et Mor.* var. **lutescens** *Nelmes*, var. nov. ; a typo foliis longioribus, spicis longioribus lutescentibus, glumis brevioribus, utriculis brevioribus differt.

JAVA : Pasoeroean ; Mt. Smeroe, Ranoe Koembolo, 6 July 1929, *Jeswiet* 40 (typus, Herb. Lugd.-Bat. ; dupl., Herb. Kew.).

This is not merely a colour variant, as can be seen from the description, and it seems well worthy of varietal rank.

Carex phacelostachys *Nelmes*, sp. nov. ; affinis *C. verticillatae* Zoll. et Mor., sed fasciculis pro rata paucispicatis, sexubus in spicis alia ratione dispositis, glumis longioribus longius aristatis, utriculis majoribus nervosis brevius latiusque rostratis differt.

Caespitosa. *Rhizoma* obliquum, breviter stoloniferum, gracile, lignosum, squamis brevibus valde nervosis brunneis vestitis. *Culmi* erecti vel suberecti, apice ut videtur subcernui, trigoni, 30–50 cm. alti, inferne circiter 1·5 mm. crassi, apice parce scaberulo excepto laeves, rhachi inferne saepe vaginis aphyllis longe vestita, basi, infra folia, cataphyllis rubidis paucis circumdati. *Folia* plerumque basilaria vel subbasilaria, sed 1-plures in culmo superne sita, plerumque culmo breviora sed pauca eo sublongiores, 2·5–6 mm. lata, plana vel planiuscula, marginibus interdum revoluta, subcoriacea, supra superne scabrida ; *vaginae* foliorum basilarium ventre membranaceae et saepe rubidae, ore concavae et glabrae. *Inflorescentia* gracilis, continua vel paullo interrupte paniculata, 24–27·5 cm. superiores culmorum occupans ; *fasciculi* 5–7, quoque fasciculo 1–3 spicato, spicis inaequaliter pedunculatis, brevipedunculatis simplicibus, longipedunculatis in spicas simplices 2–6 ramosis, fasciculi superiores approximati vel subapproximati et fastigiati vel subfastigiati, inferiores subdistantes sed saepe subfastigiati. *Bracteae* inferiores foliaceae, culmo multo breviores vel eo sublongiores, longivaginantes, superiores multo redactae, subfoliaceae, filiformes, plerumque culmo breviores sed interdum eo sublongiores, breviter vel sublongivaginantes. *Spicae* (supremis aliisque longioribus curvatis vel cernuis exceptis) strictae, erectae vel suberectae, spicae fasciculorum inferiorem et mediorum, dum simplices, femineae, spicae mediae, dum ramosae vel longipedunculatae, androgynaeceae, spicae superioes masculae vel basi floribus paucis femineis instructae, cylindricae, 1–8 cm. longae, laxivel subdensiflorae, masculae et partes masculae androgynaecearum 1–2 mm. crassae, femineae 4–5 mm. crassae ; *pedunculi* obtuse trigoni vel subtereti, tenues (0·25–0·6 mm. crassi), laeves. *Bracteolae* vaginiformes, tubulosae. *Cladoprophylla* ocreiformia vel subutriculiformia, 2–4·5 mm. longa, apice interdum biloba. *Glumae femineae* oblongo-ovatae vel oblongolanceolatae, basi gibbae, incurvae, inferne cymbiformes, apice plerumque obtusae vel obtusissimae, interdum subacutae, 4–6 mm. longae, circiter 2 mm. latae, translucentes, rubidae, marginibus latissime albo-hyalinae, demum erosae, tenuiter nervosae, nervo mediano saepe pallido, apicem versus hispidulo, carinato, in aristam hispidulam 0·25–1·5 mm. longam excurrente ; *glumae masculae* longiores et latiores. *Utriculi* ellipsoidei, trigoni, 5·5–5·75 mm. longi, circiter 1 mm. lati, membranacei, dorsaliter 3–6-nervis, ventraliter 2-5-nervis, angustissime marginati, glabri, stricti vel leviter recurvati, demum subpatuli, olivacei, rubri vel atrorubro-maculati, inferne acuminati et spongioso-pseudo-stipitati, apice sensim vel subsensim rostrati ; *rostrum* leviter acuminatum, concavoconvexum, 1·5–2·5 mm. longum, anguste marginatum, glabrescens vel sparse hispidulo-marginatum, bilobum vel bidentatum ; *os* ventraliter subobliquum ; *dentes* vel lobi stricti, albo-hyalini, demum erosi. *Achaenium* oblongo-ellipsoideum, interdum oblongo-obovoideum, trigonum, 1·75 2 mm. longum, 0·9 mm. latum, inferne acuminatum, vix stipitatum, apice subrotundum erostratum. *Stylus* basi incrassatus. Stigmata 3, longiuscula.

MALAY PENINSULA : Perak ; Gunong Kerbau, 1980 m., 12 March 1913, *H. C. Robinson* (typus, Herb. Kew.).

This species has lain unnamed since its discovery, except that Ridley wrote ‘ *C. walkeri* var.’ on the Kew and Singapore sheets. It is a much smaller plant than *C. walkeri* Arn. ex Boott, and more closely related to that other member of its group, *C. verticillata* Zoll. et Mor. Closer still is an unnamed Laos plant (Mt. Pu Bia, *Kerr* 21041), about which I am not yet sufficiently sure to include here.

var. **losirensis** (*Kükenth.*) *Nelmes*, comb. nov. ; a typo fasciculis pro rata multispicatis, spicis laxifloris, utriculis ellipsoidei-lanceolatis longius rostratis differt.

C. decora Boott var. *losirensis* Kükenth. in Bull. Jard. Bot. Buitenz. sér. 3, 16 : 319 : 1940.

SUMATRA : Atjeh ; Gajolanden, Mt. Losir, mid-summit and burntover east summit and ridge, common, 2950–3500 m., 5–6 Feb. 1937, *van*

Steenis *8682 ; ibid., mountain heath, *van Steenis* 8658 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

I have compared this Sumatran sedge with the Indian *C. decora* Boott, and to me the two are abundantly distinct. I place the former between *C. verticillata* and *C. phacelostachys*, but nearer to *C. phacelostachys*.

Carex atrosanguinea *Nelmes*, sp. nov. ; affinis *C. gibbsiae* Rendle, sed glumis et utriculis atro-rubris, rostris brevioribus subsensim acuminatis, stipitibus multo brevioribus, achaeniis majoribus oblongo-ellipsoideo-obovoideis differt.

Vix caespitosa. *Rhizoma* elongatum sed haud longe stoloniferum, crassiusculum, lignosum. *Culmus* erectus vel apice leviter cernuus, trigonus, 77 cm. altus, inferne 1·5 mm. crassus, rhachibus inferne inclusis laevis, angulis acutis apicem versus parce scaberulous. *Folia* basilaria, longa sed culmo multo breviora, 4–5 mm. lata, planiuscula vel marginibus revoluta, supra apicem versus scabrida longe attenuata ; *vaginae* brevissimae, rubidae vel atro-rubidae, demum fibrillosae. *Inflorescentia* interrupte anguste paniculata, 49 cm. superiores culmorum occupans ; *fasciculi* 7, quoque fasciculo 4–6-spicato, spicis simplicibus, fasciculi inferiores distantes, superiores subapproximatae. *Bracteae* fasciculorum inferiorum foliaceae, fasciculum proprium aequantes vel excedentes longivaginantes, superiores multo redactae setaceae, fasciculo proprio multo breviores, breviter vaginantes ; *vaginae* dorso inferne atro-rubrae, superne viridi-rubrae, ventre membranaceae, inferiores glabrae, superiores superne minute setulosae. *Spicae* erectae vel longiores subcernuae, in quoque fasciculo inaequaliter pedunculatae sed fastigiatae, androgynaeceae sed parte mascula brevi, 2–4 cm. longae, parte feminea 2·5–3·5 mm. crassa, parte mascula tenuissima, sublaxiflorae, spicae fasciculorum superiorum vix vel breviter, inferiores inaequaliter longe, exserte pedunculatae ; *pedunculi* tenues (0·5–0·6 mm. crassi), trigoni vel compressi, angulis plus minus minute scaberuli. *Glumae femineae* obovatae vel oblongo-obovatae, apicem versus triangulares, vel oblongae et apice rotundatae, basi incurvae, superne cymbiformes, apice subacutae vel obtusissimae, 2·75–3·3 mm. longae, 1·52 mm. latae, subtranslucentes, glabrae, inferne marginibus pallide viridulae, ceterum atro-rubrae, sed marginibus apicem versus anguste vel sublate albo-hyalinae, tenuiter sed distincte nervosae, vitta mediana trinervi, nervis superne coalitis, sub apicem excurrente ; *arista* marginibus minute hispidula, usque 1·2 mm. longa. *Utriculi* ellipsoidei sed basi et apice attenuati, trigoni, faciebus planiusculi, 5–6 mm. longi, 0·9–1·1 mm. lati, membranacei, ventre tenuiter 1–4-nerves, dorso 3–6-nerves, anguste marginati, basi glabra excepta subparce albo-hispiduli, saepe etiam marginibus et secus nervos, stricti, subpatuli vel patuli, plerumque inferne pallide flavido-virides et superne atro-rubri, basi sensim acuminati spongioso-incrassati, stipite ipso brevissimo (0·2–0·4 mm. longa), in rostrum sensim vel subsensim acuminati ; *rostrum* sensim acuminatum, plano-convexum, 1·75–2·25 mm. longum, anguste marginatum, hispidulo-marginatum, inferne atro-rubrum, superne viride, bidentatum ; *os* haud obliquum ; *dentes* stricti, lanceolati, 0·3–0·5 mm. longi. *Achaenium* oblongo-ellipsoideo-obovoideum, trigonum, faciebus concavum, 3–3·5 mm. longum, 0·8–0·9 mm. latum, stramineum sed basi albidum, 0·3–0·4 mm. stipitatum ; *rostrum* subtrigonum, 0·2–0·5 mm. longum, strictum vel interdum subinflexum. *Stylus* basi subincrassatus. *Stigmata* 3, raro 2, 3–4 mm. longa, curvata vel flexuosa.

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*This is labelled (probably in error) as 'type', but no. 8658 is much the better specimen and I choose this as lectotype.

PAPUA : Central Division ; Mt. Tafa, a few plants on open burnt-over ground in mossy forest, 2350 m., May–Sept. 1933, *Brass* 4068 (typus, Herb. Lugd.-Bat. ; fragm., Herb. Kew.).

This species, though closely related to *C. gibbsiae* (Fiji) looks very distinct because of its different colouring.

Carex pullei *Nelmes*, sp. nov. ; affinis *C. atrosanguineae* Nelmes, sed foliis angustioribus, spicis interdum compositis, glumis superne interdum furfuraceo-hispidulis, utriculis minoribus oblongo-ellipsoideis dorsaliter glabris, achaeniis multo brevioribus differt.

Laxe caespitosa. *Culmus* erectus vel apice leviter cernuus, trigonus, circiter 60 cm. altus, inferne 1–2 mm. crassus, rhachi superne angulis scaberula excepta laevis, basi vaginis aphyllis fusco-rubidis circumdatus. *Folia* basilaria vel subbasilaria, culmo breviora, 2–4 mm. lata, plana vel canaliculato-conduplicata, saepe supra scabrida, rigida ; *vaginae* atro-rubidae, basilares demum fibrillosae. *Inflorescentia* interrupte anguste paniculata, 25–40 cm. superiores culmorum occupans ; *paniculae secundariae* 4–6, fasciculatae, quoque fasciculo 1–7-spicato, spicis plerumque simplicibus sed longioribus saepe in spicas 1-plures breviores ramosis, fasciculae inferiores distantes, superiores subapproximatae. *Bracteae* panicularum inferiorum foliaceae, fasciculum proprium aequantes vel eo longiores, longe vaginantes, bracteae superiores multo minores, setaceae, fasciculo proprio breviores, breviter vaginantes ; *vaginae* glabrae vel superiores ore minute hispidulae, inferne rubido-spadiceae, ventre membranaceae. *Spicae* erectae vel longiores subcernuae, cylindricae, inaequaliter pedunculatae, fastigiatae, androgynaeceae, 1–4 cm. longae, parte mascula quam pars feminea breviore, tenues, parte feminea 2–3 mm. crassa, sublaxiflora, spicae fasciculorum superiorum vix vel breviter, inferiores longe vel longissime, exserte pedunculatae ; *pedunculi* tenues (0·2–0·25 mm. crassi), trigoni vel compressi, angulis glabri vel minute scabro-hispiduli. *Glumae femineae* plus minus oblongae vel oblongo-obovatae, apice triangulares, cymbiformes, basi incurvae, apice acutae vel obtusae saepe leviter ciliolatae, 2–3 mm. longae, 1–1·8 mm. latae, subtranslucentes, plerumque glabrae sed superne interdum minute furfuraceo-hispidulae, vinaceae vel fusco-rubrae, marginibus superne late albo-hyalinae, demum erosae, basi pallidae, vel basi fusco-rubra excepta albidae, tenuiter nervosae, vitta mediana trinervi nervis superne coalitis ex apice plerumque in aristam laevem vel minute hispidulam excurrente usque 0·75 mm. longam. *Utriculi* anguste ellipsoidei vel oblongo-ellipsoidei, distincte trigoni, faciebus planiusculi, 3–4 mm. longi, 0·8–1 mm. lati, membranacei, ventre (facie adaxiali) enerves vel tenuiter 1–3-nerves, dorso (facie abaxiali) tenuiter 4-nerves, vix vel angustissime marginati, dorso glabri, ventre superne parce vel parcissime setulosi, marginibus supra medio vel basi breviter setulosi, stricti vel leviter recurvi, demum patuli, inferne olivacei, interdum rubido-vel fusco-vinaceo-maculati, vel fusco-atro-rubri, basi acuminati, spongioso-incrassati, stipite ipso brevissimo, apice subsensim rostrati ; *rostrum* acuminatum, plano-convexum, 1–1·5 mm. longum, anguste marginatum, setuloso-marginatum, bidentulum ; *os* vix dorso obliquum ; *dentes* glabri, pallidi, demum erosi, stricti, lanceolati, brevissimi (0·2 mm. longi). *Achaenium* ellipsoideum vel oblongo-ellipsoideum, trigonum, faciebus planiusculum vel subconcavum, 1·6–2 mm. longum, 0·75–0·8 mm. latum, demum rubido-brunneum, vix stipitatum, vix vel brevissime (usque 0·2 mm.) stricte vel interdum leviter inflexe rostratum. *Stylus* basi leviter incrassatus. *Stigmata* 3.

DUTCH NEW GUINEA : Treub Mountain ; heathy south slope, on slate (schist), 2400 m., 17 Feb. 1913, *Pulle* 1112B (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

NORTH-EAST NEW GUINEA : Morobe District ; Matap Station, mossy and bushy slope, 1500–1800 m., 13 March 1940, *Clemens* 41023.

This species is not just a smaller *C. atrosanguinea*, its two gatherings, though both poor specimens, exhibiting several clearly distinctive characters.

C. celebica *Kükenth.* in Engl. Bot. Jahrb. 70 : 465 : 1940.

I have now seen the type of this species and no longer doubt that the later described *C. constricta* S. T. Blake is synonymous with it.

Carex eymae *Nelmes*, sp. nov. ; affinis *C. borneënsi* C. B. Clarke, sed glumis brevioribus hispidulis, utriculis dense hispidulis multinerviis breviter rostratis differt.

Caespitosa. *Rhizoma* breve, gracile. *Culmi* erecti vel suberecti, trigoni, 17–48 cm. alti, tenues (0·5–0·75 mm. crassi), basi laeves, superne infra nodos ad angulos scaberuli, basi vaginis aphyllis paucis spadiceis circumdati. *Folia* basilaria et subbasilaria, cum duobus caulinis, culmo plus minus aequilonga, 2–3·5 mm. lata, planiuscula vel revoluta, supra superne scabrida ; *vaginae* foliorum basilarium brevissimae, glabrae vel setulosae, spadiceae, demum fibrillosae. *Spicae* 4–8, interdum singulae sed mediae plerumque inaequaliter binae, superiores 5–18 cm. culmi occupantes, androgynaeceae, erectae vel suberectae, superiores approximatae vel subapproximatae, fastigiatae, inferiores distantes, 1·5–3·5 cm. longae, parte mascula quam pars feminea plerumque multo breviore sed interdum ei aequilonga vel longiore, circiter 1 mm. crassa, parte feminea 2·5–4 mm. crassa, omnino sublaxiflorae, superiores vix vel breviter inferiores longe exserte pedunculatae ; *pedunculi* tenues, glabri vel dense hispiduli. *Bracteae* spicarum inferiorum foliaceae vel setaceae, spica propria longiores vel breviores, bractearum superiorum vaginis breviter vel longe aristatis, superiores breviter inferiores longivaginantes ; *vaginae* plerumque dense sed minute pallide setulosae, spadiceae vel ferruginae, nodis fuscae. *Glumae femineae* oblongo-ovatae vel oblongae, triente apicali triangulari, basi incurvae, superne cymbiformes, apice obtusae, obtusissimae vel sub bilobi-emarginatae, raro subacutae, 2·25–3 mm. longae, 1·4–2 mm. latae, subtranslucentes, basi glabrae vel glabrescentes excepta dense subadpresse hispidulae, ferrugineae, nervosae, marginibus superne enerves, vix vel late albido-hyalinae, demum erosae, nervo mediano prominente, apicem vix vel haud attingente vel excurrente ; *arista* usque 1 mm. longa, marginibus hispidula. *Utriculi*

anguste ellipsoidei vel oblongo-ellipsoidei, sed basi et apice attenuati, trigoni, faciebus planiusculi, 5–5·75 mm. longi, 0·9–1 mm. lati, subcoriacei, multinerves, vix vel anguste marginati, pallide subadpresse hispiduli, substricti, viridi-ferruginei, basi pseudo-stipitati, 0·2–0·4 mm. stipitati, sensim vel subsensim rostrati ; *rostrum* acuminatum, plano-convexum, 1·75–2 mm. longum, anguste marginatum, minute hispidulum, bidentatum ; *os* haud vel vix dorso obliquum ; *dentes* stricti, usque 0·5 mm. longi. *Achaenium* oblongum vel oblongo-ellipsoideum, trigonum, circiter 3 mm. longum, 0·8–0·9 mm. latum, brunneum, brevissime stipitatum, abrupte rostratum ; *rostrum* brevissimum (circiter 0·2 mm. longum), strictum vel subreflexum. *Stylus* basi vix vel subincrassatus. *Stigmata* 3, vel interdum 2.

CELEBES : Enrékang, between Angin Angin and Pintealon, forest, 1550–2600 m., 15 June 1937, *Eyma* 482 (typus, Herb. Kew. ; dupl., Herb. Hort. Bogor.).

I was for a time inclined to treat this and *C. clemensii* Kükenth. as varieties of *C. borneënsis*, but further study has led me to accept the three as closely related but distinct species.

C. pseudo-rivulorum *Kükenth.* in Bull. Jard. Bot. Buitenz. sér. 3, 16 : 319 : 1940.

C. rivulorum Ridley in Journ. F. M. S. Mus. 6 : 195 : 1915, non Dunn.

C. breviglumis Ridley in Fl. Mal. Penins. 5 : 183 : 1925.

The type specimen of *C. breviglumis* differs from that of *C. rivulorum* almost only in its shorter glumes. Now, through an intermediate specimen from Singapore, the two plants are seen to be specifically linked together.

C. kinabaluensis *Stapf* in Journ. Linn. Soc. 42 : 183 : 1914.

" Borneo : Mt. Kinabalu ; below Pakapaka cave, 2700 m., under trees. *Gibbs* 4240. Undoubtedly an ally of *C. brunnea*." (Stapf, l.c.).

I was unable to see the type of this species when preparing my Malaysian *Carex* Key, but I placed it, in accordance with its description, with *C. brunnea* and its allies. Recently I examined the type, the only specimen known, at the British Museum, and was very surprised to find that Stapf had made a mistake in describing and figuring it as having 2 stigmas. The styles are really 3-branched, and I consider that the species belongs to a different group of the genus, one which also contains *C. verticillata* Zoll. et Mor. and *C. borneënsis* C. B. Clarke.

C. brunnea *Thunb.* Fl. Japon. 38 : 1784.

[*C. teinogyna* (non Boott)—Kükenth. l.c. 320.]

SUMATRA : Atjeh ; Gajolanden, Sangir Valley, upper Blang Kedjeren, on rocks in stream-valley, 1050–1150 m., 19 March 1937, *van Steenis* 9839 ; between Goempang and Kongké on the bank of the Lau Alas among stones, 700 m., 12 March 1937, *van Steenis* 9804.

C. teinogyna Boott is readily distinguished from *C. brunnea* by, among other characters, its extremely long stigmas ; and it is apparently confined to India.

C. brunnea *Thunb.* var. **dolichocarpa** *Nelmes*, var. nov. ; a typo glumis marginibus superne late albo-hyalinis, utriculis 1 mm. stipitatis et 2 mm. rostratis inclusis 5-5·75 mm. longis differt.

JAVA : Besoeki ; Gendingwaloeh, ravine, not common, 1450 m., 8 July 1916, *Koorders* 42960β ; ibid., Ijang complex, Mt. Argopoero, north-west slope, rain-forest, common, 1800 m., 23 April 1914, *Backer* 13298 ; ibid., Ijang complex, west slope, route Bermi-Taman Hidoep, locally common, along forest path, 1600-1800 m., 13 July 1938, *van Steenis* 10809 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

Sharp distinctions are not often seen among the components of this extremely polymorphic species, but such long utricles as occur in this Java plant have not been seen by me in *C. brunnea* throughout its extended range from Australia to India.

Carex buruensis *Nelmes*, sp. nov. ; affinis *C. brunneae* Thunb., sed foliis subfiliformibus, inflorescentiis multo brevioribus spicatis, glumis longioribus angustioribus, utriculis angustioribus rostris longioribus, achaeniis angustioribus differt.

Caespitosa. *Rhizoma* breve vel elongatum, gracile, squamis vaginatis spadiceis, circumdatum. *Culmi* erecti vel subcurvati, obscure vel obtuse trigoni 12–28 cm. alti, gracillimi (circiter 0·3 mm. crassi), rhachibus inclusis laeves. *Folia* numerosa, subbasilaria, basilaria ad vaginas aphyllas redacta, plerumque culmis breviora, subfiliformia, crassiuscula ; *vaginae* vaginis aphyllis inclusae, marginibus in fibras tenues reticulatim fissae. *Spicae* 2–4, androgynaeceae, strictae, erectae vel suberectae, superiores approximatae inferiores subapproximatae vel magis separatae, pauci- et sublaxiflorae, subcylindricae, 7–14 mm. longae 2–3 mm., crassae, pedunculatae, inflorescentiam terminalem 2–5 cm. longam eformantes ; *pedunculi* in vaginis omnino inclusi vel ex iis breviter exserti, tenues, laeves. *Bractea* spicae infimae subfoliacea, inflorescentia brevior vel eam aequans, *bracteae* superiores ad glumas aristatas redactae, vaginantes ; *vaginae* rubido-brunneae, inferiores longae, superiores breves. *Glumae femineae* lanceolatae vel oblongo-lanceolatae, cymbiformes, acuminatae, apice acutae vel subacutae, 3–4·5 mm. longae, circiter 1 mm. latae, tenuiter nervosae, pallide rubidae vel pallidae lineolis rubidis maculatae, marginibus interdum inaequaliter albidae, nervo mediano apicem circiter attingente. *Utriculi* elliptica vel ovato-elliptici, plano-convexi vel compressi, 3·5–4·5 mm. longi, 0·8–1 mm. lati, membranacei, angustissime marginati, multinerves, marginibus et basi superne nervis lateralibus paucis parcissime vitreo-setulosi, ceterum glabri, stricti, suberecti, rubido-brunnei vel ferruginei, basi subabrupte in stipitem cuneatum 0·5–0·75 mm. longum angustati, apice sensim rostrati ; *rostrum* acuminatum, compressum, 1–1·5 mm. longum, glabrescens vel marginibus parcissime vitreo-setulosum, bidentulum ; *os* haud vel vix obliquum ; *dentes* breves, demum erosi. *Achaenium* oblongo-ellipticum vel oblongo-ovatum, compresse plano-convexum, 2 mm. longum, 0·8–0·9 mm. latum, erostratum, vix stipitatum, stramineum, demum brunneum. *Stylus* basi haud vel subincrassatus. *Stigmata* 2, utriculo breviora.

MOLUCCAS : North-west Buru (Boeroe), Mt. Fogha (?Togha), on open ridges, 1800–2050 m., end of Feb. 1912, *Stresemann* (II Freiburger

Molukken-Expedition no. 390) (typus, Herb. Lugd.-Bat. ; dupl., Herb. Kew.).

Carex buruensis is one of the most distinctive of the many variants hovering round the periphery of *C. brunnea* Thunb.

C. brevis *S. T. Blake* in Journ. Arn. Arb. 28 : 111 : 1947.

CELEBES : Enrékang ; Rante Mario, open ground, 3300 m., 17 June 1937, *Eyma* 753 ; ibid., open bare ground, plateau south-east of summit, locally common, 3400 m., 20 June 1937, *Eyma* 864.

These Celebes gatherings are interesting as coming from an area about mid-way between the other two known localities for the species, Papua and Borneo.

Carex stenura *Nelmes*, sp. nov. ; affinis *C. speciosae* Kunth, sed foliis angustioribus, spicis tenuioribus multo longioribus, utriculis multo minoribus differt.

Caespitosa. *Rhizoma* brevissimum, lignosum. *Culmi* erecti vel obliqui, trigoni, angulis acutis, 15–52 cm. alti, tenuissimi, sublaeves, basi vaginis spadiceis vel fuscis vestiti, demum fibrillosi. *Folia* subbasilaria, plerumque culmo longiora, 2–3 mm. lata, plana vel planiuscula, marginibus interdum revoluta, supra superne scabrida. *Spicae* 1–3, e nodis remotiusculis ortae, infima interdum e vagina basali orta, androgynaeceae, plus minus cylindricae, 3–8 cm. longae, tenues, subdensiflorae, parte feminea 2·5–3 mm. crassa, quam pars mascula multo breviore vel ei aequilonga, plerumque breviter exserte pedunculatae ; *pedunculi* trigoni, angulis acutis, plerumque laeves. *Bracteae* spicarum lateralium foliaceae, culmum excedentes, vaginantes ; *vaginae* ventre membranae. *Glumae femineae* ovatae vel oblongo-ovatae, basi incurvae, superne cymbiformes, apice acutae vel obtusae, circiter 2·5 mm. longae, 2 mm. latae, translucentes, tenues et albido-stramineae, brunneo-nervosae, marginibus superne eroso-cioliolatae, nervo mediano apicem vix vel circiter attingente. *Utriculi* plus minus ellipsoidei sed inferne curvato-acuminati, trigoni, circiter 4 mm. longi, circiter 1 mm. lati, subcoriacei, tenuiter multinerves, anguste marginati, glabri, marginibus superne ciliolato-hispiduli, stricti, patuli, viridi-straminei, basi vix stipitati, apice subsensim rostrati ; *rostrum* acuminatum, subtrigonum vel plano-convexum, breve, glabrescens, subpallidum, brevissime bilobum ; *lobi* circiter 1 mm. longi, marginibus pallidi. *Achaenium* ellipsoideum, trigonum, angulis prominentibus, pallidum, faciebus planiusculum vel concavum, brunneum, circiter 3 mm. longum, circiter 1 mm. latum, inferne acuminatum, subabrupte 0·75 mm. stipitatum, apice rotundatum, abrupte 0·2 mm. rostratum. *Stylus* basi subincrassatus. *Stigmata* 3.

BORNEO : Dutch Borneo ; Banjermasin(g), Mt. Pandamaran, on dry serpentine rocks, 1857–58, *Motley* 1222 (typus, Herb. Kew.). " Arch. Ind.", Herb. Waitz.

C. speciosa is a very variable sedge throughout its range from India to Malaysia, and its separation from *C. courtallensis* Nees has not yet been clearly defined. There seems, however, no doubt about the specific distinctness from each, of this very slender Bornean plant.

C. anomocarya *Nelmes*, sp. nov. ; affinis *C. harlandii* Boott, sed foliis angustioribus, glumis longius aristatis, utriculis longius dentatis differt.

Laxe caespitosa. *Rhizoma* breve, estoloniferum. *Culmi* centrales, erecti, obtuse vel acute trigoni, 30–46 cm. alti, inferne 1·5–2 mm. crassi, rhachibus inclusis laeves. *Folia* numerosae, basilaria, plerumque culmum multo superantia, 6–20 mm. lata, plana vel planiuscula. *Spicae* 3–4, erectae, subdensiflorae, terminalis mascula, tenuiter cylindrica, 2·5–5·5 cm. longa, laterales femineae, oblongo-cylindricae, 3·5–8 cm. longae, 6–9 mm. crassae, infima saepe distante excepta cum terminali approximatae et fastigiatae, breviter vel brevissime exserte pedunculatae ; *pedunculi* obscure trigoni, subvalidi, laeves. *Bracteae* spicarum lateralium foliaceae sed superiores minores, culmum excedentes, breviter vaginantes ; *vaginae* subampliatae, ore pallidae et membranaceae. *Glumae femineae* oblongae sed sursum acuminatae, raro oblongo-lanceolatae, basi incrassatae et subincurvatae, ceterae cymbiformes vel planiusculae, apice subtruncatae vel subbilobo-emarginatae, raro subacutae, 3–4·5 mm. longae, 1·5–2·5 mm. latae, sordide albidae, marginibus tenues, translucentes, enerves, apicem versus ciliolatae, vitta mediana trinervi (nervis apice coalitis) et excurrente ; *arista* lata, acuminata, laevis vel marginibus scaberula, 2–10 mm. longa. *Utriculi* contorto-ellipsoidei, superficie irregulari varie concava vel convexa achaenio conformi, subinflati, 7·25–10·25 mm. longi, 2–2·8 mm. lati, coriacei, multinerves, laeves glabri, vix marginati, stricti, demum subpatuli vel patuli, basi spongiosi vix stipitati, apice rostrati ; *rostrum* compressum, 2·5–4 mm. longum, basi subabrupte inflatum, superne vix acuminatum laeve, glabrum, utrinque mediano sulcatum, viridi-marginatum, bidentatum ; *os* non obliquum ; *dentes* lanceolati, 0·75–1·75 mm. longi, sublaeves, pallidi, divergentes. *Achaenium* irregulariter ellipsoideum, contorto-trigonum, 4–5·5 mm. longum, 0·8–2 mm. latum, superne faciebus planiusculum, medio convexum, inferne concavum, angulis medio profunde excavatum, superficie dense sed minute alveolata, abrupte breviter interdum inflexe stipitatum, abrupte vel subabrupte rostratum ; *rostrum* cylindricum, 0·5–1 mm. longum, interdum flexuosum, in apicem pallidum discoideo-annulatum expansum. *Stylus* basi incrassatus. persistens. *Stigmata* 3.

HAINAN : Yaichow ; in woods on ravine, March–July 1933, *How* 70387.

INDO-CHINA : Tonkin ; Tam Dam massif, ca. 900 m., Feb. 1923, *Petelot* 1313, partim.

SUMATRA : Dolok Singgalang, north of the Toba lake, in thin forest, 1700 m., 25 May 1922, *Lörzing* 8871.

JAVA: Preanger; Mt. Bèsèr, near Tjidadap, south of Tjibeber, 1200 m., in forest, abundant, 20 June 1923, *Bakhuizen van den Brink f.* 2793 ; Tjadas Malang, near Tjidadap, south of Tjibeber, in damp forest, 1000 m., 1 Oct. 1923, *Winckel* 1692β (typus, Herb. Lugd.-Bat. ; dupl., Herb. Kew.).

The several ways in which this species differs from *C. harlandii*, a species of Hongkong and S. China, give it a quite different facies.

C. wahuensis *C. A. Mey* in Mém. Acad. St. Petersb. 1 : 218, t. X : 1831.

C. erythrolepis Kükenth. in Engl. Pflanzenr. IV, 20 : 628 : 1909.

"Java (Hillebrand ! in herb. musei berol. sine indicatione loci)."

When I was constructing my Key to the *Carices* of Malaysia (Kew Bull. 1946, 5–29) I had not seen the type of *C. erythrolepis*, which was probably destroyed in the Berlin herbarium during the late war. I was therefore very interested to find in the sedge loan from Buitenzorg fruit fragments of the type, which enabled me to amplify Kükenthal's description and then to realise that it agreed with that of *C. wahuensis*, an endemic of the Hawaiian (Sandwich) Islands. I do not know whether Hillebrand collected in Java, but he of course did so extensively in Hawaii, and unless contrary evidence is forthcoming I shall assume that "Java" is a mistake for "Hawaii", and omit *C. erythrolepis* from my Malaysian revision.

C. lateralis *Kükenth.* in Engl. Pflanzenr. IV, 20 : 639 : 1909.

C. elmeri Kükenth. in Fedde Repert. Spec. Nov. 8 : 326 : 1910.

SUMATRA : Palembang ; Air Njeroek, 1400 m., July–Aug. 1916, *Ajoeb* 416.—Determined by Kükenthal as *C. elmeri* Kükenth.

Specimens of *C. elmeri* Kükenth. from Buitenzorg and Leiden, more mature than those at Kew, convince me that *C. elmeri* must be considered synonymous with *C. lateralis.*

C. doniana *Spreng.* var. **cacuminis** *Nelmes*, var. nov. ; a typo culmis multo brevioribus, foliis angustioribus, spicis multo brevioribus, utriculis submajoribus differt.

CELEBES : Masámba ; summit of Mt. Kamboeno, 2860 m., common, open country, partly grazed (probably by anoa—the small wild buffalo of Celebes, *Anoa depressicornis*), 28 July 1937, *Eyma* 1395 (typus, Herb. Kew. ; dupl., Herb. Hort. Bogor.).

This looks very different from *C. doniana*, chiefly because of its extremely short stems, 2–4 (12) cm. long, compared with those of the species, which range from 30 cm. to 80 cm. The bracketed figure represents the length of one stem among a considerable number of dwarf ones, checking one's inclination to treat this Celebes plant as a new species.

C. oedorrhampha *Nelmes* var. **microcarya** *Nelmes*, var. nov. ; a typo glumis minoribus, rostris utriculorum vix inflatis, achaeniis interdum obovoideis vel orbiculato-obovoideis multo brevioribus differt.

[*C. olivacea* (non Boott)—Kükenth. l.c. 321].

SUMATRA : West coast ; Korinchi Peak, forest, 1750 m., 23 March 1920, *Bünnemeijer* 9138 (typus, Herb. Kew. ; dupl., Herb. Hort. Bogor.) ; ibid., margin of lake, 2020 m., 15 April 1920, *Bünnemeijer* 9476 ; ibid., 19 April 1920, *Bünnemeijer* 9618. Atjeh ; Gajolanden, Losir massif, wet places by stream, 2100–2250 m., 29 Jan. 1937, *van Steenis* 8431.

The warrant for treating this as a variant of *C. oedorrhampha* lies almost wholly in the achene, which departs so radically in length and shape from that of its species—and so surprisingly, seeing that the outward, visible parts of species and variety are almost indistinguishable.

C. finitima *Boott*, Illustr. 1 : 44, t. 112 : 1858.

C. atjehensis Kükenth. l.c. 314.

SUMATRA : Atjeh ; Gajolanden, Poetjoek Agoesan, mountain ridge, in undergrowth, 2400–2700 m., 28 Jan. 1937, *van Steenis* 8366.

This record forms a link between the northern (E. Himalaya and W. China) and southern (New Guinea—see Kew Bull. 1949, 385, 391) localities, the only ones previously known of this species.

C. maculata *Boott* in Trans. Linn. Soc. 20 : 128 : 1846.

[*C. pruinosa* (non Boott)—Kükenth. l.c. 317.]

MOLUCCAS : Boeroe (Buru) ; Koentoeroean, 1200 m., 9 June 1921, *Toxopeus* 276.

A still further extension of this species. which was described from a Ceylon specimen, and subsequently found not only in China and Japan but also in Sumatra and Java, where it was also (*van Steenis* 4290, *Docters van Leeuwen-Reijnvaan* 13317) mistaken for *C. pruinosa.*

C. elibates *Nelmes* in Kew Bull. 1937 : 353 : 1937.

C. maculata Boott var. *sanguineo-squamata* Kükenth. l.c. 317.

SUMATRA : Atjeh ; Gajolanden, Mt. Losir, on burnt mountain ridges, 2600 m., 7 Feb. 1937, *van Steenis* 8720 ; ibid., Goh Lemboek peak, by a stream in damp mossy forest, 21-22 Feb. 1937, *van Steenis* 9125.

forma *humilior* Kükenth. l.c. 317.

SUMATRA : ibid., summit of the middle peak, 3300-3500 m., 2 Feb. 1937, *van Steenis* 8581.

C. elibates has hitherto been known only from its type area in the Malay Peninsula. Van Steenis's Sumatran plant, described by Kükenthal as a variety of *C. maculata,* is slightly larger in some of its parts than typical *C. elibates*, but is obviously the same species, and f. *humilior* is (for me) just a dwarf state of it.

CELEBES : Poso, between Boro and Poena, quartz peat plateau, on sandy path, common, forming tufts, short, 1700-1800 m., 10 Aug. 1937, *Eyma* 1605 ; ibid., on peaty spots, *Eyma* 1616.

Eyma's Celebes specimens are very short-stemmed and narrow-leaved, and the glumes are subacute at the apex. Otherwise they match the type of *C. elibates* and I place them in this species.

Carex petecticalis *Nelmes*, sp. nov. ; affinis *C. spathulatae* (Kukenth.) Nelmes, sed inflorescentiis longioribus, spicis longioribus, utriculis ovatis vel ellipticis brevioribus, rostris brevioribus vix marginatis haud inflexis neque tortis, achaeniis brevioribus differt.

[*C. phacota* (non Spreng.)—Kükenth. l.c. 317.]

Laxe caespitosa. *Rhizoma* curvato-elongatum, lignosum, 2–4 mm. crassum. *Culmi* erecti, trigoni, angulis acutis, 75–120 cm. alti, 2·5-3 mm. crassi, rhachibus inclusis laeves, basi cataphyllis brevibus crassis fusco-rubidis circumdati. *Folia* subbasilaria et caulina, superiora longa sed culmo breviora, 3–11 mm. lata, planiuscula vel marginibus revoluta, inferiora ad vaginas breviter laminatas redacta ; *vaginae* longissimae, culmi trientin infimam vestientes, inferiores dorso saepe vinaceae, ventre membranaceae, in fibras tenues reticulatim fissae. *Spicae* 4–8, cernuae, superiores subapproximatae, inferiores subdistantes, infima excepta fastigiatae, gynaecandrae, plus minus cylindricae, 3-6 cm. longae, parte mascula 3–5 mm. crassa, parte feminea 4·5-7·5 mm. crassa, densiflorae, basi saepe laxiflorae, superiores breviter vel brevissime inferiores longipedunculatae, parte masula brevi vel brevissima, inferiores interdum

apice masculae ; *pedunculi* obtuse trigoni vel subteretes, tenues (0·2–0·3 mm. crassi), laeves. *Bracteae* inferiores foliaceae, culmo longiores, subherbaceae vel setaceae, superiores multo redactae, evaginantes. *Glumae femineae* ellipticae, oblongo-ellipticae, oblongo-obovatae, vel plus minus oblongae, basi incurvae, superne cymbiformes vel planiusculae, apice saepe obtusissime vel plus minus truncatae, interdum subobtusae, 1·75–3·25 mm. longae, 1·1–1·3 mm. latae, fusco- vel atro-rubrae, marginibus superne interdum anguste pallidae, lateribus enerves, vitta mediana trinervis superne subcoalitis ex apice in aristam latam planam acuminatam pallidam sublaevem vel marginibus parce hispidulam 0·25–1·25 mm. longam excurrente. *Utriculi* ovati vel elliptici, plano-convexi vel compresso-subplano-convexi, 2·75–3·5 mm. longi, 1·3–1·9 mm. lati, submembranacei, anguste marginati, utrinque 3–5-nerves, glabri, stricti, demum patuli, cinereo-straminei et lineolis rubidis dense maculati, interdum laete rubido-suffusi, vel superne atro-rubri, superne minute papillosi, apicem versus saepe cinerei, basi plus minus rotundati et vix stipitati, apice acuminati ; *rostrum* inferne acuminatum et compressum, superne subcylindricum, haud vel vix marginatum, 0·5–0·75 mm. longum, plerumque pallidum, subintegrum vel emarginatum ; *os* haud vel dorso subobliquum. *Achaenium* late ellipticum vel suborbiculatum, compresso-biconvexum, 1·5–2 mm. longum, 1·25–1·8 mm. latum, brunneum, basi brevissime pseudo-stipitatum, apice abrupte tenuissime et brevissime (circiter 0·2–0·3 mm. longum) rostratum. *Stylus* brevissimus, tenuis, basi subincrassatus. *Stigmata* 2.

SUMATRA : Korinchi Peak, 2190 m., 24 April 1914, *Robinson & Kloss* ; Mt. Talakmau, north-west slope, forest, 2100 m., 23 May 1917, *Bünnemeijer* 795 ; Mt. Singgalang, underwood, near lake, 2800 m., 1 June 1918, *Bünnemeijer* 2907 ; Mt. Korinchi, forest, near river, 2300 m., 10 May 1920, *Bünnemeijer* 10438.

JAVA : Preanger ; Mt. Papandajan, *Warburg* 2582 ; ibid., Mt. Papandajan, tegal Boeng-broeng, damp ground, common, ± 2300 m., 27 July 1936, *van Slooten* 2622 (typus, Herb. Hort. Bogor. ; dupl. Herb. Kew.) ; ibid., marsh near Tjibeureum-gede, ± 2300 m., 21 Jan. 1930, *van Steenis* 4104a (partim) ; ibid., 2300 m., 27 Dec. 1930, *van der Pijl* 301.

This member of the Malaysian group of sedges which contains also *C. kemiriensis* and *C. spathulata* has been generally misidentified as *C. phacota*.

Carex kemiriensis *Nelmes*, sp. nov. ; affinis *C. petecticali* Nelmes, sed glumis longioribus longius aristatis, utriculis majoribus enerviis dense papillosis differt.

C. teres Boott var. *spathulata* Kükenth. in. Bull. Jard. Bot. Buitenz. sér. 3, 16 : 316 : 1940, partim.

Rhizoma nullum. *Culmi* erecti, trigoni, angulis acutis, 55–108 cm. alti, inferne 2–3 mm. crassi, laeves sed rhachibus angulis parce scaberuli, basi cataphyllis fusco-rubidis paucis crassis circumdati. *Folia* subbasilaria et caulina, superiores culmo longiora, 4·5–7 mm. lata, planiuscula vel marginibus revoluta, inferiora ad vaginas breviter laminatas redacta ; *vaginae* longissimae, culmi trientem infimum vestientes, inferiores dorso vinaceae vel rubido-nervosae vel pallidae, ventre tenuissimae, membranaceae, pallidae vel aureae, et in fibras tenues reticulatim fissae. *Spicae* 5–6, erectae usque cernuae, infima distante excepta approximatae vel subapproximatae et fastigiatae, gynaecandrae, cylindricae, (1·5) 2–5 cm. longae, parte mascula 2–3 mm. crassa, parte feminea 7–10 mm. crassa, densiflorae, basi interdum laxiflorae, superiores breviter inferiores longipedunculatae, parte mascula brevissima vel partem femineam aequans vel ea longiores ; *pedunculi* obscure trigoni, tenues (0·4–0·5 mm. crassi), laeves, saepe curvati. *Bracteae* inferiores foliaceae, culmo longiores, superiores subherbaceae vel setaceae, multo redactae, evaginantes. *Glumae femineae* elliptico-oblongae vel oblongo-obovatae, planiusculae vel subcymbiformes, marginibus interdum incurvae, apice obtusae vel truncato-rotundatae, 3–3·8 mm. longae, 0·9–1·8 mm. latae, vix subtranslucentes, rubido-brunneae vel atro-brunneae, latere enerves, vitta mediana trinervi nervis superne subcoalitis ex apice in aristam latam planam acuminatam rubido-brunneam laevem vel marginibus parce hispidulam 1–2 mm. longam excurrente. *Utriculi* elliptici, subplano-convexi vel compresso-biconvexi, 3·5–4·5 mm. longi, 1·9–2 mm. lati, membranacei, anguste marginati, enerves vel tenuissime et obscure paucinerves, dense minute papillosi, glabri, stricti, demum patuli, inferne aurei vel straminei, superne fusco-brunnei, basi spongioso-incrassati, truncato-rotundati, abrupte vix vel brevissime stipitati, apice acuminati, brevirostrati ; *rostrum* inferne compressum et acuminatum, superne subcylindricum, haud vel anguste marginatum, 0·5–0·75 mm. longum, fusco-brunneum, subintegrum vel emarginatum ; *os* parvulum, haud vel subobliquum. *Achaenium* late ellipticum vel suborbiculatum, interdum obovatum, compresso-biconvexum, circiter 2 mm. longum, 1·5–1·6 mm. latum, brunneum, basi brevissime pseudo-stipitatum, apice abrupte tenuissime et brevissime (circiter 0·2 mm. longum) rostratum. *Stylus* parvulus, tenuis, basi vix incrassatus. *Stigmata* 2.

SUMATRA : Atjeh ; Gajolanden, Mt. Kemiri, east slope, near summit, forest ridge and plateau, damp mountain meadow, 2900–3314 m., 7 March 1937, *van Steenis* 9587 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

Kükenthal cites 4 gatherings, all van Steenis numbers, from Atjeh, Sumatra, at the end of his description of *C. teres* Boott var. *spathulata*. Only 2 of these were included in the loan of *Carices* from Buitenzorg, and these, in my opinion, represent 2 species. The first cited, *van Steenis* 8746, agrees well with the description of Kükenthal's variety, which I have raised to specific rank, and I choose this as the lectotype. The other of the 2 numbers seen, *van Steenis* 9587, is described above as *C. kemiriensis*, whose larger, nerveless, papillose utricles seem very distinct from those of its allies. The identification of the two cited numbers not seen by me, *van Steenis* 8536, 8657, must remain for the present, perhaps for ever, unknown to me. *C. spathulata* differs from *C. teres* (India) principally in its stouter and shorter spikes, a difference which appears to be constant and which alone gives the two plants a wholly dissimilar appearance.

C. spathulata (*Kükenth.*) *Nelmes*, stat. nov.

C. teres Boott var. *spathulata* Kükenth. l.c. 316.

SUMATRA : Atjeh ; Gajolanden, from Lau Alas over the Agoesan crest towards Blang Kedjeren, on the margin of a swamp in ericoid forest on the ridges of the Senoebong mountains, 2500 m., 8 Feb. 1937, *van Steenis* 8746 (typus, Herb. Hort. Bogor. ; fragm., Herb. Kew.).

See note at end of description of *C. kemiriensis* above.

C. dimorpholepis *Steud.* Synops. Cyp. 2 : 214 : 1855.

C. cernua Boott, Illustr. 4 : 171, t. 578 : 1867, non J. F. Gmel.

There is a sheet of this species in the Leiden herbarium labelled "Carex ±hexastachys—bilolepis—teste J. Valckenaer Suringar—Archip. Ind.? —leg.?" The Director of the Rijksherbarium, Leiden, has kindly informed me that there are " no reliable data " about this gathering, so that the occurrence of *C. dimorpholepis* in Malaysia must remain doubtful.

C. divulsa *Stokes* var. **javanica** *Nelmes*, var. nov. ; a typo spicis magis numerosis, inflorescentibus longioribus, glumis femineis oblongo-lanceolatis vel ovato-lanceolatis saepe longe acuminatis differt.

JAVA: Preanger ; Mt. Papandajan, 1500 m., woods, Feb. 1915, *Ridley* (one, flowering stem only—mounted, and presumably collected, with the plant described next below) (typus, Herb. Kew.).

C. pairaei *F. Schultz* var. **javanica** *Nelmes*, var. nov. ; a typo glumis magis acuminatis apice acutis, utriculis marginibus superne hispidulis differt.

JAVA : Preanger ; Mt. Papandajan, woods, Feb. 1915, *Ridley* (typus, Herb. Kew.).

The above-described pair of interesting discoveries recalls the controversial question as to how and when these 'outpost', 'bipolar' plants travelled so far from their apparent headquarters. Other examples are *C. echinata* Murr., *C. canescens* L. (*C. buxbaumii* Wahlenb.), and *C. curta* Gooden. on the Australian alps, the last-mentioned also from New Guinea, several such in New Zealand, and others in other countries, some agreeing closely with, others differing more or less from, their 'home' species in the northern hemisphere.

C. monopleura *Krecz.* in Not. Syst. Herb. Inst. Bot. Acad. Sci. URSS, 7 : 35 : 1937.

C. remota L. var. *rochebrunii* (Franch. et Savat.) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 707 : 1894, quoad pl. Sikkim.

C. remota subsp. *rochebrunii* (Franch. et Savat.) Kükenth. in Engl. Pflanzenr. IV, 20 : 234 : 1909, quoad pl. Sikkim.

[*C. rochebrunii* (non Franch. et Savat.)—Nelmes in Kew Bull. 1946 : 7, 29 : 1946.]

There seems no doubt that this Malaysian plant is conspecific with the Sikkim *C. monopleura*, which I had not at hand when drawing up the Malaysian *Carex* Key. The species often has a sterile terminal spike, a very rare occurrence in the *Vigneae*.

A NEW CAREX FROM THE MALAY PENINSULA.

E. NELMES.

Carex malayana *Nelmes*, sp. nov. ; affinis *C. rhynchachaenio* C. B. Clarke, sed foliis latioribus, utriculis majoribus praecipue differt.

Rhizoma stoloniferum, circiter 1·5 mm. crassum. *Culmi* erecti, 10–24 cm. alti, trigoni, tenues (0·75–1 mm. crassi), inferne laeves, superne angulis scaberuli. *Folia* subnumerosa, basilaria, culmo multo longiores, 5–7 mm. lata, planiuscula, rigida ; *vaginae* spadiceae, demum fibrillosae. *Spicae* 4–6, infima excepta interdum subapproximata contiguae vel approximatae, erectae vel suberectae, 1–3·6 cm. longae, terminalis mascula, tenuis (circiter 1 mm. crassa), laterales femineae vel androgynaeceae, 2–3 mm. crassae, laxiflorae, vix vel breviter pedunculatae ; *pedunculi* trigoni, angulis laeves vel scaberuli. *Bracteae* subfoliaceae, culmum aequantes vel superantes, vix vel breviter vaginantes, superiores minores. *Glumae femineae* oblongo-ovatae vel oblongo-lanceolatae, basi incurvae, superne planiusculae vel cymbiformes, apice acutae vel obtusissimae, 2·75–4 mm. longae, 1·6–1·8 mm. latae, tenuiter nervosae, pallidae, demum brunneae, marginibus inferne late albo-hyalinae, apice eroso-ciliolatae, muticae vel vix mucronulatae. *Utriculi* lageniformes, obscure trigoni, 7–7·5 mm. longi, 1·6–1·8 mm. lati, subcoriacei, multinerves, vix marginati, parce puberuli, stricti, suberecti vel subpatuli, superne virides, inferne straminei, basi vix vel breviter stipitati, apice sensim rostrati ; *rostrum* vix acuminatum, compressum, 2–2·25 mm. longum, bidentulatum ; *ore* haud obliquum ; *dentes* stricti. *Achaenium* oblongum sed inferne acuminatum, trigonum, faciebus inferne concavum, circiter 4 mm. longum, stramineum demum brunneum, stipitatum, apice producto in collum breviter cylindricum 1 mm. longum 0·8–0·9 mm. latum vertice truncatum. *Stylus* brevis, basi incrassatus. *Stigmata* 3.

MALAY PENINSULA : Pahang ; Gunong Tahan, July 1911, *Ridley* 16340 (typus in Herb. Kew. ; duplum in Herb. Mus. Brit.).

BULBOSTYLIS TRIFIDA (NEES) NELMES.

At the request of Dr. R. Pichi-Sermolli, Istituto Botanico della Universita di Firenze, the following extract from the MS of a paper, " Results of the Vernay Nyasaland Expedition, 1946, Cyperaceae collected by L. J. Brass. By E. Nelmes ", is here published. The new combination concerned is required by Dr. Pichi-Sermolli for use in a forthcoming work on his Abyssinian plants. Publication of the full paper, which was prepared some time ago, still awaits the completion of certain other groups by other contributors.

Bulbostylis *C. B. Clarke.*

Bulbostylis trifida (*Nees*) *Nelmes*, comb. nov.

Isolepis trifida Nees in Wight, Contrib. Bot. Ind. 108 : 1834.

Bulbostylis capillaris (L.) C. B. Clarke var. *trifida* (Nees) C. B. Clarke in Hook. f. Fl. Brit. Ind. 6 : 652 : 1893.

Zomba District : Zomba Plateau, alt. 1500 m., June 5, 1946, *Brass* 16247, confined to shallow wet soil on rocky seepage slopes.—Old World tropics and subtropics.

C. B. Clarke, in Hook. f. Fl. Brit. Ind. 6 : 651 : 1893, attributed the genus *Bulbostylis* to Kunth (Enum. Pl. 2 : 205 : 1837), citing the following combinations : *B. barbata* Kunth, Enum. ii. 208, *B. capillaris* l.c. 212, and *B. puberula* Kunth. l.c. 213. Kunth, however, merely suggested that one of his sections of *Isolepis* could be regarded as a separate genus and mentioned *Bulbostylis* as a suitable name. In fact, he treated this name as a synonym in his index by italicizing it, and, following his mention of it (p. 205) in a short description of a section of *Isolepis*, proceeded to describe all the members of the section as species of *Isolepis*. Kunth, therefore, is scarcely the author of *Bulbostylis*, and certainly not the author of the combinations under this name attributed to him by Clarke. It seems unfortunate that "*Bulbostylis* Kunth" has been conserved, against *Bulbostylis* DC (1836), *Bulbostylis* Stev. (1813) and *Stenophyllus* Rafin. (1825).

There is also some doubt as to the identity of *Scirpus capillaris* L. Linnaeus gives the distribution as "Virginia, Aethiopia, Zeylona", but his "type" specimen probably came from Clayton, from America. It certainly agrees with the American "B. capillaris", which has obtuse, pubescent glumes, and not with the Indian plant, the glumes of which are acute and glabrous.

The Brass material from Nyasaland is a good match of the Indian plant, and, pending a full investigation of the problems briefly touched upon above, is treated as a distinct species based on *Isolepis trifida* Nees.—E. Nelmes.

Trees found in the Transvaal*.—This interesting and useful little booklet on the trees found in the Transvaal has been published by the Boy Scouts' Association in the Transvaal for the use of boy scouts. Short, popular descriptions of 53 trees are given accompanied by illustrations which include habit pictures to assist in the identification of the trees from their shape. Each description is headed by the botanical name followed by the common names in English, Afrikaans and Zulu, and an indication as to whether the tree described is a native of South Africa or introduced. An index giving the common and botanical names is also provided. The booklet forms a helpful and handy little guide to the recognition of many of the trees and shrubs which the boys are likely to meet with in their scouting activities in the veld.

H. S. Marshall.

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*By M. Bolton. Pp. iv+55. Johannesburg : The Boy Scouts' Association. 1949. Price 2/6.

A CORRECTION

In accordance with Article 70, Note 2 and Rec. XLIV of the International Rules of Nomenclature, the specific names '*nepheliphila*' and '*poiphagorum*' which appear in Kew Bull. 1948, pp. 140 and 143 respectively, should be spelt '*nephelophila*' and '*poophagorum*'. These spellings will be adopted in the Index Kewensis.

N. L. Bor.

PLANTS OF THE CAMBRIDGE EXPEDITION, 1947-1948 : I.

J. P. M. Brenan.

From December 1947 to April 1948 the Cambridge Expedition, under the leadership of Dr. (now Professor) P. W. Richards, was carrying out investigations, principally in the rain-forest, in Southern Nigeria and the British Cameroons. The other members of the Expedition were Dr. G. C. Evans, Dr. E. W. Jones, and the present writer ; Mr. C. F. A. Onochie, of the Nigerian Forestry Department, was seconded to the Expedition, and Mr. R. W. J. Keay of the same Department paid us short visits from time to time.

Over 1300 numbers of phanerogams were collected, and to save confusion, all gatherings, whoever collected them, were with very few exceptions given the writer's own serial numbers.

Most of the time was spent in Okomu Forest Reserve, about 20 miles east of Benin City ; but during this time the Expedition as a whole, or individual members of it, made short visits to other localities. For about the last month the Expedition, except Dr. Evans, was in the British Cameroons.

The most important centres for collecting, and the approximate dates of the Expedition's stay at each, are as follows :—

6.12.1947–30.12.1947 : Okomu Forest Reserve, Nigeria.
31.12.1947– 6. 1.1948 : Idanre, Nigeria.
8. 1.1948–29. 2.1948 : Okomu Forest Reserve, Nigeria.
2. 3.1948– 8. 3.1948 : Calabar and neighbourhood, Nigeria.
10. 3.1948–21. 3.1948 : Banga and Bopo, S. Bakundu Forest Reserve, British Cameroons.
22. 3.1948– 4. 4.1948 : Buea, Mimbia, and the Cameroon Mountain, British Cameroons.

In addition to the above, some collecting was done on a short visit to Sapoba, and a good deal on occasional visits to Ibadan.

Other aspects of the Expedition's work will be written up elsewhere, but the systematic botanical side will be dealt with in periodical papers under the same title as at the head of this one.

Most of the plants collected by the Cambridge Expedition are represented by several sets, which have been or will be distributed to various herbaria. To save space the following abbreviations for herbaria will be used :—

K = Royal Botanic Gardens, Kew.
O = Imperial Forestry Institute, University of Oxford.
FHI = Forest Herbarium, Forestry Department, Ibadan, Nigeria.
BM = British Museum (Natural History).
P = Paris.
CA = Cambridge University.
B = Brussels.
A = East African Agricultural and Forestry Research Organisation, Amani, Tanganyika Territory.
CO = Coimbra.

NEW OR NOTEWORTHY SPECIES FROM THE IDANRE HILLS, NIGERIA.

As mentioned above, the Cambridge Expedition spent the New Year at Idanre (31.12.1947–6.1.1948), during which time more than a hundred numbers were collected ; these have been worked out separately and before the rest of the collections, and the results given in the present paper.

We hope to publish elsewhere a fuller account of these little-known but very attractive hills. Meanwhile it must be sufficient to say that they are a small but complex range of low mountains, rising to more than 900 m., and situated in the Akure Division of Ondo Province in Southern Nigeria some 20 miles E. of Ondo. Out of the earth have pushed grey bare rounded domes of granite on whose inhospitable flanks shreds of forest and fragmentary mats of *Trilepis* and grass lead a precarious existence. On the lower part of these domes seasonal trickles ooze, dry alas when we were there, but during the rains nourishing a wealth of short-lived herbs. In the deep valleys between the various peaks, where there is shelter and depth of soil, forest occurs, though merely as tattered relics amid the insatiable plantations.

Although these hills are isolated in the rain-forest zone, their endemic element is a low one, though there is evidence of several very distinct varieties, to be described in another paper, being restricted to Idanre. Two very distinct new species described in the present paper appear to be endemic, and Mr. C. E. Hubbard has described a new species of grass, *Panicum gemmeum*, in Kew Bull. **1949,** 361 (1949), from specimens collected by the Expedition at Idanre. But the case of a new *Ipomoea*, to be dealt with elsewhere, which appeared to be a good Idanre endemic until several specimens were unearthed from Uganda, teaches you caution in making over-hasty generalisations about endemism in Africa !

CRUCIFERAE

Rorippa humifusa (*Guill. et Perr.*) *Brenan*, comb. nov.

Nasturtium humifusum Guill. et Perr., Fl. Seneg. Tent. **1,** 19 (1831) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 92 (1927) ; A. Chevalier, Flore Vivante de l'A.O.F. **1,** 213 (1938).

Nasturtium benuënse Hutch. et Dalz. *l.c.*, et in Kew Bull. **1928,** 26 (1928), *synon. nov.*

Oyo Province, Ife Division : Awaran River, 4 miles on the Ife side of Ifetedo, 10 Feb. 1948, *J. P. M. Brenan and C. F. A. Onochie* 8983 (K, FHI, BM, P, CA, B, A, CO) :—annual herb, rosettes of leaves ± appressed to ground ; flowers very small, in small, short racemes from centre of rosette ; growing on damp exposed sand by a small stream, with *Ageratum conyzoides* ; plants small and flowering on open sand by water, larger and fruiting among taller vegetation further from water's edge. Ondo Province, Akure Division : Deep valley between Olurere and Orosun peaks, alt. 380 m., 5 Jan. 1948, *J. P. M. Brenan and Dr. E. W. Jones* 8733 (K, FHI) :—annual herb, almost stemless ; leaves yellowish-green ; flowers greenish ; a weed in a sandy stream-bed, very scattered.

Hutchinson and Dalziel separated *N. benuënse* from *N. humifusum* by the shorter leaves, the " inflorescence terminating leafy shoots ", the shorter oblong-lanceolate fruit and very short style. By the Awaran River, small plants resembling *N. benuënse* in size were on the open sand most recently laid bare by the falling waters of the stream, while further away, among other vegetation, the plants become larger and comparable with typical *N. humifusum* in size. Pod-size and style-length vary greatly, even in single gatherings ; thus pods of plants under the number *Welwitsch* 1197 (Angola) vary between 4 and 10 mm. in length. Every intermediate can be found between the short pods of *N. benuënse* and the long pods of *N. humifusum.* The alleged difference in the position of the inflorescence is misleading : the difference in appearance is due to *N. benuënse* being " caulescent ", with the internodes of the main stem rather longer than usual. Some of the Awaran River plants are similarly " caulescent ", while a combination of extreme development of " caulescence " with large size of leaves is shown by *Irvine* 1756 (Gold Coast).

It seems that we can no longer maintain *Nasturtium* R. Br. as a genus distinct from *Rorippa* Scop. For a discussion of the reasons see Hylander in Bot. Notiser **1950,** Häfte 1, 1 13 (1950), also Mansfeld in Fedde, Repert. **46,** 117 sqq. (1939).

LECYTHIDACEAE

Napoleona cuspidata Miers in Trans. Linn. Soc., Ser. 2, **1,** 10 (1875) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 203-4 (1927) ; Knuth in Engl. Pflanzenr. **4.219,** 70 (1939).

Napoleona miersii Hook. f., Bot. Mag., Ser. 3, **47,** t. 7199 (1891) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 203–4 (1927) ; Knuth in Engl. Pflanzenr. **4.219,** 69 (1939), *synon. nov.*

Napoleona imperialis P. Beauv. var. *cuspidata* (Miers) Engl., Pflanzenw. Afr. **3** pt. 2, 660 (1921).

Ondo Province, Akure Division : Lower slopes of Carter's Peak, Idanre, alt. about 490 m., 1 Jan. 1948, *J. P. M. Brenan, Dr. E. W. Jones, R. W. J. Keay and Dr. P. W. Richards* 8646 (K, FHI, O, P, BM, CA) :— cauliflorous tree about 6 m. high with bushy crown ; leaves subcoriaceous, deep green and glossy above, paler beneath, midrib prominent, pale green ; flowers borne in leaf-axils and on woody cushions to base of trunk ; petals yellowish-brown with purple radiating lines ; stamens and corona white ; stigma pinkish ; in low forest among rocks.

I can detect no differences between the types of *N. cuspidata* and *M. miersii* except for the longer acumen of the former, and the development of glandular teeth on either side of its base. These characters are so variable, even on a single gathering, and appear to be correlated neither with one another, nor with the habitat of the plant, that I feel compelled to amalgamate the two species.

MELASTOMATACEAE

Dissotis idanreënsis *Brenan*, sp. nov.; propter calycis tubum squamis squarrosis apice paucisetosis laxiuscule vestitum aliter glabrum prope *D. lambii* Hutch. et *D. grandifloram* Benth. ponenda; habitu excelso fruticoso, ramulis densissime et appresse setuloso-pubescentibus, indumento foliorum ut videtur multo densiore, squamis calycis plerumque longioribus ab ambabus plane differt.

Frutex usque ad 3 m. altus, virgate ramosus. *Ramuli* juniores plus minusve tetragoni, haud alati, densissime et appresse setuloso-pubescentes, seniores grisei, tarde glabrati, cortice longitudinaliter striato-rimoso obtecti, internodiis ramulorum sterilium abbreviatis circiter 4–10 mm longis, eis ramulorum floriferorum elongatis; nodi annulo setarum 4–11 mm. longarum ornati. *Folia* inter tempus sitis decidua, anthesi nondum omnino expansa tunc circiter 2–3·5 cm. longa, 1–1·8 cm. lata; folia matura (e plantis in Hort. Kew. cultis descripta) ovato-elliptica usque oblonga, circiter 5·5–9·5 cm. longa, 2·5–5·1 cm. lata, apice subacuta vel acuta basi rotundata vel attenuata, utrinque pilis griseis satis mollibus ad margines adversis et sursum (ad folii apicem) curvatis sed vix appressis dense vestita, nervis primariis longitudinalibus 3–7 supra impressis subtus prominentibus venis transversis inconspicuis conjunctis; petiolus brevis, circiter 1·2–1·5 cm. longus, more ramulorum vestitus, sed etiam setis appressis. *Paniculae* terminales, amplae, usque ad circiter 30 cm. longae et 20 cm. latae, aphyllae vel fere aphyllae, internodiis axis circiter 4·5–7·5 cm. longis. *Bracteae* caducissimae, ovatae, glabrae, apice acuto penicillatae, 4–6 mm. longae, basi circiter 3 mm. latae. *Pedicelli* brevissimi, 1–2 mm. longi, setoso-pubescentes. *Calycis tubus* oblongus vel ellipsoideus, basi elongato rotundatus, 8–9 mm. longus, 4·5 mm. latus, extra squamis breviter quadratis usque oblongis 0·5–2 mm. longis 0·4–0·75 mm. latis squarrosis rigidis apice setis 3–6 albidis radiatis inaequalibus 0·5–2·5 mm. longis coronatis laxiuscule vestitus, aliter glaberrimus; lobi 5, reflexi, lanceolati, circiter 1·5 cm. longi, 3·5–4 mm. lati, undulati, glabri, margine sparse ciliolati, apice in coronam setularum terminantes, inter anthesin caduci; lobi totidem squamis angustis 5 mm. longis corona setularum ornatis alternantes. *Petala* rubroviolacea, late elliptica, 2·5–3 cm. longa, 1·6–1·7 cm. lata, basi cuneata, apice abrupte subacuta et in setulam deflexam desinentia. *Staminum filamenta* arcuata, circiter 1·1–1·2 cm. longa; connectivum staminum majorum 2 cm. longum, arcuatum, basi in appendiculum 1 mm. longum bifidum et rectum productum, connectivum staminum minorum 4 mm. longum, basi in appendiculum 0·5 mm. longum bifidum et uncinatum productum; antherae majorae 1·1 cm. longae 1·5 mm. crassae, minorae 9 mm. longae 1 mm. crassae. *Pars libera ovarii* glabra, superne 5-angulata et circa basin styli corona setularum ornata. *Stylus* 2 cm. longus, arcuatus, glaber. *Calyx fructifer* paulum accrescens, usque ad 13 mm. longus, 8 mm. latus. *Capsula* superne quinquevalvata, setis apicalibus persistentibus. *Semina* oblique reniformia, straminea, verruculosa, 0·6 mm. longa, 0·5 mm. lata.

Ondo Province, Akure Division: Near foot of Carter's Peak near

Idanre, alt. about 460 m., 3 Jan. 1948, *J. P. M. Brenan and R. W. J. Keay* 8694 (typus in Herb. Kew, FHI, P, B) :—virgately branched almost leafless shrub up to about 3 m. high ; stems grey ; leaves mid-green above, three nerves impressed, pale green beneath with nerves prominent ; calyx-tube green ; scales green to purple, apical setae hyaline ; petals vivid magenta ; bases of stamens yellow, connective with red patch at base ; larger anthers purple with pink backs, smaller lilac with whitish backs ; growing on dry rocks and in *Trilepis* (*Catagyna*) mats.

This very handsome *Dissotis* produces its large magenta flowers during the dry season when the plant is nearly or quite leafless. A second smaller species, also shrubby, grows with *D. idanreënsis*, but was long past flowering when we were there. Seeds of both were brought back to Kew, and the mature leaves of the present species, which had disappeared when we were at Idanre, are described from these cultivated plants. The second species is being described elsewhere as a new variety of *D. rotundifolia* (Sm.) Triana.

EUPHORBIACEAE

Phyllanthus nigericus *Brenan*, sp. nov. ; *P. boehmii* Pax et *P. dekindtii* Hutch. affinis, ab hoc foliis majoribus basi apiceque rotundatis, stipulis longioribus magis attenuato-filiformibus, stylis basi haud connatis, glandulis disci in floribus masculis papillis 4–5 tantum ornatis, ab illo thecis antherarum rima horizontali dehiscentibus necnon glandulis disci in floribus masculis papillosis nec laevibus, ab ambabus seminibus dorso lineis 9–10 nec 15–17 notatis et stigmatibus multo minoribus differt.

Herba verisimiliter annua, glaberrima, caulibus basi plus minusve decumbentibus et brunneis deinde erectis vel flexuosis tenuibus subteretibus circiter 1 mm. diametro superne plus minusve purpurascentibus et ramos paucos floriferos patentes 1·5–6 cm. longos singulatim emittentibus. *Folia* oblongo-elliptica usque oblongo-obovata, 5–9 mm. longa, 3–5 mm. lata, tenuia, apice rotundata vel ea in ima rami parte plus minusve mucronata, basi rotundata, supra flavo-viridia, subtus pallide glauco-viridia, marginibus saepe purpurascentibus, costa supra obscura subtus prominula, nervis lateralibus utrinque 3–4 subtus tantum aegre cernendis ; stipulae lineari-filiformes, circiter 1·5 mm. longae. *Flores* monoeci, masculi minimi ex axillis rami inferioribus singuli vel bini, foeminei majores ex axillis superioribus singulatim exorientes. *Flores masculi* 0·5–0·75 mm. longe pedicellati ; tepala 5, elliptico-suborbicularia vel suborbicularia, concavo-convexa, apice rotundata, circiter 0·7 mm. longa et lata ; disci glandulae 5, papillis 4–5 ornatae ; stamina 3, filamentis in columellam circiter 0·3 mm. altam omnino connatis, antheris ita apice ut videtur sessilibus, thecis rima brevi transversa dehiscentibus. *Flores foeminei* 1–1·5 mm. longe pedicellati ; tepala 5, breviter oblonga, apice rotundata vel aliquantulum cucullata, circiter 1·5 mm. longa et 1 mm. lata ; discus crenis brevibus 9 ; ovarium depresso-subglobosum, lobis laevibus haud papillosis ; styli perparvi, 0·2 mm. alti, liberi, bifidi, erecto-patentes. *Fructus* pedicellis 2·5 mm. longis suffulti, subnutantes, tepalis persistentibus accrescentibus tunc

2·5 mm. longis 1·5 mm. latis medio viridibus late albo-marginatis ; capsula circiter 2 mm. diametro, trilobata, laevis. *Semina* pallide brunnea, dorso lineis tenuibus longitudinalibus 9–10 notata.

Ondo Province, Akure Division : In a wet flush with short vegetation near the foot of Carter's Peak near Idanre, alt. about 490 m., 3 Jan. 1948, *J. P. M. Brenan and R. W. J. Keay* 8693 (typus in Herb. Kew., FHI) :—annual herb ; stems decumbent at base, slender, purplish above; leaves yellow-green above, pale glaucous-green beneath ; fruits drooping; perianth-segments pale green in centre, with white margins.

Although a Nigerian plant, the closest affinity of *P. nigericus* is not with any of the other *Phyllanthi* of this region but with *P. boehmii* Pax of East Africa and with *P. dekindtii* Hutch. from Angola. The distinctions between *P. nigericus* and *P. boehmii* are clear and definite. Unfortunately all the material of *P. dekindtii* that I have seen is some fragments of *Teuscz* 38 and *Dekindt* 273 ; they are so exiguous as to make it difficult to obtain a clear picture of *P. dekindtii. Teuscz* 38 clearly shows the styles connate at the base, while this character is not clear in the Dekindt specimen. Also, neither of the fragments shows seeds ; the seeds of both *P. boehmii* and *P. dekindtii* are described (Fl. Trop. Afr. **6** (**1**), 719 : 1912) as being marked with about fifteen lines down the back and those of *P. boehmii* are certainly quite distinct in this character from those of *P. nigericus* ; I have therefore had to rely entirely on Hutchinson's description at this point. However, the number of lines does seem, within narrow limits, to be very constant for each species. It is thus clear that the status and specific characters of *P. nigericus* must to some extent depend on further knowledge and better specimens of *P. dekindtii.*

In the key to *Phyllanthus* in Hutchinson and Dalziel, Fl. W. Trop. Afr. **1**, 290 (1928), *P. nigericus* comes into that section including species 11–13, with flowering branches not fasciculate, 5 tepals in both sexes, and 3 wholly connate stamen-filaments. As this part of the key is misleading is some important points, and *P. nigericus* has to be added, the following substitute is suggested, to follow on beneath the line starting " Sepals of both sexes 5 . . . . " :—

Ovary prominently warted ; curved back of seed marked with 12–14 fine longitudinal ridges ; leaves oblong ; ♂ flowers 2–3 together in lower leaf-axils of branches, ♀ solitary in upper axils ; disc of ♀ flower stellate with 5 deep lobes ; styles very short, deeply bifid *P. niruroides* Muell. Arg.

Ovary smooth ; curved back of seed marked with 5–10 longitudinal ridges :

  Tepals in fruit 2·5 mm. long, ± embracing and subequalling the ripe fruit ; back of seed with 9–10 faint longitudinal ridges ; plant with few (up to 10) lateral branches ; flowers arranged as in *P. niruroides* ; anther-thecae horizontally dehiscing ; disc of ♀ flowers shallowly 9-crenate ; styles very short, deeply bifid at apex . . . . *P. nigericus* Brenan

  Tepals in fruit 0·75–1·5 mm. long, scarcely embracing and much shorter than the ripe fruit ; back of seed with 5–7 more prominent longitudinal ridges ; plant normally profusely branched :

Disc of ♀ flowers annular, not lobed ; stigmas quite sessile, closely packed into a minute circle at top of ovary, each stigma when viewed from above appearing reniform with an emarginate apex ; anther-thecae dehiscing vertically ; ♂ flowers 1–2 together in lower axils of flowering branches, ♀ solitary in upper axils . . . . . *P. sublanatus* Schumach. et Thonn.

Disc of ♀ flowers stellate with normally 5 deep radiating lobes ; styles short but distinct, deeply bifid at apex, not forming a closely packed circle at the top of the ovary ; anther-thecae with markedly oblique dehiscence ; one ♂ flower together with one ♀ flower in each axil *P. amarus* Schumach. et Thonn.

While investigating the affinities of *P. nigericus*, I found considerable difficulty in distinguishing *P. amarus* Schumach. et Thonn. and *P. sublanatus* Schumach. et Thonn. Through the courtesy of the Botanical Museum at Copenhagen, the type-specimens of both these species were received on loan. These showed that the two were perfectly distinct, but that *P. sublanatus* had been much misinterpreted, and it seems worth while giving a revised synonymy and distribution for this species.

Phyllanthus sublanatus Schumach. et Thonn., Beskr. Guin. Pl., 420 (1827) ; Hutchinson in Dyer, Fl. Trop. Afr. **6** (**1**), 715 (1912), excl. spec. Ansell. ; Hutchinson et Dalziel, Fl. W. Trop. Afr. **1**, 291 (1928), excl. spec. *Ansell.* et *Dalz.* 1360.

Phyllanthus odontadenius Muell. Arg. f. *ramosus* [" ramosa "] Beille in Mém. Soc. Bot. France, Mém. **8**, 56 (1908).

Phyllanthus odontadenius Muell. Arg. var. *ramosus* (Beille) Beille ex A. Chev., Études Fl. Afr. Centr. Franç. **1**, 269 (1913), pro synon. *P. amari* Schumach. et Thonn.

[*Phyllanthus amarus* (non Schumach. et Thonn.) A. Chev., Études Fl. Afr. Centr. Franç. **1**, 269 (1913), quoad syn. *P. odontadenius* var. *ramosus* et spec. *Chev.* 9326 ; Hutchinson in Dyer, Fl. Trop. Afr. **6** (**1**), 717 (1912), quoad synon. et spec. idem (errore " 8326 ")]

[*Phyllanthus microdendron* (non Welw. ex Muell. Arg.) A. Chev., Expl. Bot. Afr. Occ. Franç. **1**, 557 (1920).]

French Sudan. In sandy cultivated ground, Sikasso, 6 May 1899, *A. Chevalier* 804 (K).

Sierra Leone. Rather wet place in the open laterite plateau, Buyabuya, Scarcies River, 8 Feb. 1892, *G. F. Scott Elliot* 4267 (K). Weed, at Rokupr, 25 Apr. 1949, *H. D. Jordan* 228 (K). Same locality, 27 Apr. 1949, *H. D. Jordan* 239 (K).

Gold Coast. Without precise locality, *Thonning s.n.* (Herb. Haun.).

Nigeria. Onitscha Province, 1911, *N. W. Thomas* 622 (K). Abinsi, a common weed, 12 Nov. 1912, *J. M. Dalziel* 763 (K).

Lower Shari. Korbo, S. of Baguirmi, 25–28 July 1903, *A. Chevalier* 9326 (K).

The epithet of this species is most unfortunate and misleading. The type-specimens are quite glabrous, and I can only assume that Schumacher and Thonning's description of the leaves as " glabris demum sublanatis " was due to some error of observation. The " slightly woolly-pubescent " leaves of *P. sublanatus* were used as a key-character even as recently as the Flora of W. Tropical Africa ; no specimen of *P. sublanatus* that I have examined is anything but quite glabrous, though the mould of poorly dried specimens of *P. amarus* and *P. sublanatus* has repeatedly done duty for the elusive and alas imaginary pubescence.

The Ansell specimen collected at Accra and cited under *P. sublanatus* in the Floras of Tropical and West Tropical Africa in fact belongs to *P. amarus*, as does *Dalziel* 1360, given under *P. sublanatus* in the last-named work.

Finally, *P. odontadenius* Muell. Arg. f. *ramosus* Beille has to be transferred in synonymy from *P. amarus* to *P. sublanatus*.

CAESALPINIACEAE

Macrolobium obanense Baker f. in Cat. Talbot Nig. 28 (1913) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 346-7 (1928).

Ondo Province, Akure Division : Orosun Mountain, near Idanre, alt. about 550 m., 2 Jan. 1948, *J. P. M. Brenan, Dr. E. W. Jones, R. W. J. Keay and Dr. P. W. Richards* 8669 (K, FHI, O, P, BM, CA, B) :—small tree about 6 m. high ; bark smooth, dark grey ; crown rounded, with arching branches ; leaflets subcoriaceous, deep green and glossy above, paler green beneath with prominent venation ; inflorescences long, pendulous, on shoots with reduced leaves arising from older twigs ; bracteoles pale green with brownish pubescence ; calyx greenish-white ; petals and stamens white ; in high forest with *Khaya grandifoliola, Sterculia tragacantha, Celtis, Ricinodendron, Uvariodendron*, etc., frequent, ascending to 760 m. alt.

M. obanense has been previously found in Nigeria in the Oban and Upper Cross River areas, and at Ubulubu in Asaba Division of Benin Province. The present station is the most westerly known for this very local and distinct species, though Aubréville, Flore Forest. Côte d'Ivoire, **1,** 236 (1936), records a " *Macrolobium aff. obanense* " from the Ivory Coast which may well be our plant.

PAPILIONACEAE

Bowringia mildbraedii Harms in Engl. Bot. Jahrb. **49,** 432 (1913) ; Baker f., Leg. Trop. Afr. 592 (1929).

Ondo Province, Akure Division : Orosun Mountain near Idanre, alt. 610 m., 2 Jan. 1948, *J. P. M. Brenan, Dr. E. W. Jones, R. W. J. Keay and Dr. P. W. Richards* 8677 (K, FHI) :—slender climber to about 3 m. ; stems green ; leaves papery, pale green and rather glossy on both sides, venation prominent beneath ; fruits dark brown, with a single dangling scarlet seed ; on edge of low deciduous scrub on rock slope. Near the rest-house at Idanre, alt. 460 m., 4 Jan. 1948, *Bayo* 8716 (K, FHI, O, P, BM, CA, B) :—slender-stemmed shrub scandent over a *Dracaena* tree ; stems slender, tough, green ; leaves papery, mid-green and somewhat glossy above, paler green and somewhat glossy beneath with prominulous venation, margins undulate ; fruit widely boat-shaped, brownish-black, gaping to expose 1 (–2) vivid scarlet glossy seeds attached to the suture.

The genus *Bowringia* has an interesting distribution : besides our West African species there is one other from China and (according to Harms, *l.c.*) Borneo. The genus is omitted from the Fl. W. Trop. Afr. In the generic key in this work *Bowringia* comes into that group of the tribe *Sophoreae* with unifoliolate leaves, with the genera *Haplormosia*, *Leucomphalus* and *Baphia*. From all these *Bowringia* may be easily separated by the combination of a cup-shaped very shortly toothed calyx, anthers much shorter than their filaments, and a short 1 (–2)-seeded pod. In fruit this is an ornamental plant, as the scarlet seeds remain attached for some time after the pod has started to gape widely open.

B. mildbraedii has been recorded previously from the French Cameroons and French Equatorial Africa. The above is not the first occasion on which it has been collected in Nigeria ; the following earlier gathering from Nigeria is in Herb. Kew. : Onitsha Province, Onitsha Division : Onitsha, 3 Sept. 1909, *Comm. A. H. Unwin* 76.

ULMACEAE

Celtis scotellioides A. Chev. in Bull. Soc. Bot. France, **61,** Mém. **8e,** 299 (1917), et Expl. Bot. Afr. Occ. Franç. **1,** 590 (1920).

[*Celtis prantlii* (non Priem. ex Engl.) Rendle in Prain, Fl. Trop. Afr. **6** (**2**), 8 (1916) ; Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 423 (1928) ; Aubréville, Fl. Forest. Côte d'Ivoire, **1,** 28 (1936).]

Celtis crenata A. Chev., Expl. Bot. Afr. Occ. Franç. **1,** 588 (1920) *nomen nudum.*

Celtis rendleana G. Tayl. in Exell, Fl. S. Tomé, 302 (1944).

Ondo Province, Akure Division : In deep valley between Olurere and Orosun peaks, alt. about 380 m., 5 Jan. 1948, *Dr. E. W. Jones and J. P. M. Brenan* 8718 (K, FHI, O, P, BM, CA) :—small tree about 3·6 m. high ; twigs green ; leaves subcoriaceous, deep green and rather glossy above with three impressed nerves, paler green beneath ; fruits rhomboid-ellipsoid, green ; by a stream-bank through open disturbed forest.

Dr. G. Taylor has pointed out (*l.c.*) that the name *Celtis prantlii* was misapplied in the Flora of Tropical Africa to a widespread species on the mainland of West Africa, whereas the type of *C. prantlii* belongs to the species described in the Flora as *C. insularis* Rendle. He therefore proposed a new name, *C. rendleana*, for the mainland species. Unfortunately this name cannot stand since there is an earlier valid name for the species—*C. scotellioides* A. Chev.; Chevalier's description and a sheet of the type-number (*Chevalier* 21459, from the Ivory Coast) at Kew agree excellently, and there can be no question of their identity with *C. rendleana.*

HIPPOCRATEACEAE

Salacia dalzielii Hutch. et M. B. Moss in Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 451, 453 (1928) et in Kew Bull. **1929,** 22 (1929).

Salacia macrocarpa Welw. ex Oliv., Fl. Trop. Afr. **1,** 373 (1868), non Korth. in Flora **31,** 579 (1848).

Salacia macrocarpa Welw. ex Oliv. vars. *typica* Loes., *latifolia* Loes., *grandiflora* Loes. in Engl. Bot. Jahrb. **44,** 166 (1910).

Salacia euryoides Hutch. et M. B. Moss in Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 451, 453 (1928) et in Kew Bull. **1929,** 21 (1929).

Ondo Province, Akure Division: Near the rest-house at Idanre, alt. about 460 m., 31 Dec. 1947, *R. W. J. Keay* 8752 (K, FHI, O, P, BM):—climbing shrub; older stems purplish-brown with dense paler brown lenticels; leaves stiffly papery, glossy above; petals yellowish; ovary and bases of filaments green; in low scrub.

Salicia macrocarpa Welw. ex Oliv., *S. dalzielii* and *S. euryoides* are maintained as distinct species by Hutchinson and Dalziel in Fl. W. Trop. Afr. Examination of the type-specimens of these convinces me that there are no characters of specific importance to separate them.

The earliest name for the species when amalgamated, *S. macrocarpa* Welw. ex. Oliv., is unfortunately a later homonym of a Bornean species, *S. macrocarpa* Korth., and therefore must not be used.

The next two specific names referring without doubt to our plant, *S. dalzielii* and *S. euryoides,* were published simultaneously. Of these two I choose *S. dalzielii,* as the type-specimen is in better condition, having more flowers expanded.

There are, however, two other specific names, both earlier than *S. dalzielii,* which may refer to the latter species, but the evidence is in my opinion not sufficiently strong to justify their adoption at present. The first is *S. angustifolia* Scott Elliot in Journ. Linn. Soc., Bot. **30,** 75 (1895), which appears to differ from *S. dalzielii* only in the strikingly lanceolate leaves. Loesener, in Engl. Bot. Jahrb. **44,** 166 (1910), considered it a variety of *S. macrocarpa* Welw. ex Oliv., but I agree with Hutchinson and Dalziel that the evidence is not sufficient. Unfortunately *S. angustifolia* is still represented only by the type-specimen, which was collected at Limba in the Bafodeya highlands in Sierra Leone, and more material of this is much desired.

The second name concerned (omitted in Fl. W. Trop. Afr.) is *S. doeringii* Loes. in Engl. Bot. Jahrb. **44,** 166 (1910). I have not seen the type of this—*Doering* 265, which was collected near Atakpame in Togo.

Loesener admits that it may be only a variety of *S. macrocarpa* Oliv., but describes it as erect. This plant should be observed and re-collected in the type-locality.

It is possible to sort the material that I have here grouped under the name *S. dalzielii* into two divisions, one having somewhat larger flowers than the other, but apparently differing in no other way, possibly varietally distinct but certainly not specifically. In view of the small number of specimens and the possibility that the name *S. dalzielii* may have to be supplanted in the future, it seems wiser merely to note the apparent existence of these forms, and not to give them names. The exact synonymy is as follows.

(a) Petals 4·5–5 mm. long : *S. dalzielii* Hutch. et M. B. Moss, *sens. strict.*, *S. macrocarpa* Welw. ex Oliv., *sens. strict.* (=var. *typica* Loes.).

(b) Petals 6–7·5 mm. long : *S. macrocarpa* Welw. ex Oliv. vars. *latifolia* Loes. and *grandifolia* Loes., *S. euryoides* Hutch. et M. B. Moss.

The Idanre specimen cited above is the large-flowered form.

Salacia howesii Hutch. et M. B. Moss in Hutch. et Dalz., Fl. W. Trop. Afr. **1,** 452–3 (1928) et in Kew Bull. **1929,** 22 (1929).

Ondo Province, Akure Division : Orosun Mountain near Idanre, alt. 760 m., 2 Jan. 1948, *R. W. J. Keay* 8682 (K, FHI, O, P, BM) :—low spreading shrub about 1·5 m. high ; older twigs purplish-black ; leaves thinly coriaceous, dark green above when mature, pale green beneath ; peduncles and pedicels green ; flowers ochraceous-yellow ; ovary and stigmas pale green ; in shallow soil on edge of bare rock-face near margin of high forest.

Distr. Gold Coast (*Howes* 974, Anaje, 7 miles N.W. of Sekondi), now recorded from Nigeria for the first time. A very rare species, apparently, hitherto only represented by the type-specimen. On p. 452 of the Fl. W. Trop. Afr. *S. howesii* is keyed out into the group of species with " inflorescence not repeatedly branched ". It should however come into the opposite group, as the inflorescences show at least four degrees of branching. Here it would key down to *S. lucida* Oliv., from which it may be easily separated by its puberulous inflorescences and leaf-shape.

RUBIACEAE

Tricalysia sudanica A. Chev., Les Caféiers du Globe, **3,** 238 (1947).

Feretia coffeoides A. Chev. in Bull. Soc. Bot. France, **58,** Mem. **8d,** 179 (1912) ; Expl. Bot. Afr. Occ. Franç. **1,** 326 (1920).

Tricalysia coffeoides (A. Chev.) Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 82–3 (1931), non Good in Journ. Bot. **64,** suppl. 2, 18 (1926).

Ondo Province. Akure Division : Deep valley between Orosun and Olurere peaks near Idanre, alt. about 410 m., 5 Jan. 1948, *J. P. M. Brenan and Dr. E. W. Jones* 8729 (K, FHI, O, P, BM) :—shrub about

6 m. high ; leaves stiffly papery, rather pale green, falling from the tree , fruits globose, green going red and glossy, fleshy ; in dry marginal scrub on rock at foot of great bare granite massif.

Tricalysia coffeoides (A. Chev.) Hutch. et Dalz., the name used for our plant in Fl. W. Trop. Afr., is illegitimate, being a later homonym. *T. chevalieri* K. Krause in Engl. Bot. Jahrb. **43,** 141 (1909), based on *Chevalier* 7921 from the eastern Chari region, may be conspecific but differs somewhat in the smaller leaves with more impressed venation ; unfortunately I have seen no material of *T. coffeoides* (A. Chev.) Hutch. et Dalz. in a stage of development comparable with that shown by the type of *T. chevalieri.* More material is desired. Meantime, Chevalier has made a *nomen novum, T. sudanica,* for the illegitimate *T. coffeoides* (A. Chev.) Hutch. et Dalz., and this may be safely used for the present.

Psychotria talbotii Wernh. in Cat. Talbot Nig. 54 (1913) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 121, 124 (1931).

Ondo Province, Akure Division : Carter's Peak, Idanre, 18 Apr. 1943, *C. F. Symington in Forest Herbarium, Ibadan,* 3360 (O) :—large shrub ; flowers white ; in thickets on lower rocks. Lower slope of Carter's Peak, Idanre, alt. about 490 m., 1 Jan. 1948, *J. P. M. Brenan, Dr. E. W. Jones, R. W. J. Keay and Dr. P. W. Richards* 8641 (K, FHI, O, P, BM) ; shrub about 1·5–1·8 m. high, not much branched ; stems slender, grey-brown ; leaves subcoriaceous, mid-green and glossy above, pale green beneath, with linear bacterial nodules along midrib ; fruiting panicles drooping ; pedicels thickened, red ; fruits globose, fleshy, deep red. Same locality as 8641, alt. about 490 m., 1 Jan. 1948, *J. P. M. Brenan and R. W. J. Keay* 8651 (K, FHI, O, P, BM, CA) :—in shade of low forest. Idanre, alt. about 520 m., 2 Jan. 1948, *J. P. M. Brenan, Dr. E. W. Jones, R. W. J. Keay and Dr. P. W. Richards* 8679 (K) :—flowers small, white.

P. talbotii has been recorded previously only from Oban, Degema and the Rio del Rey, all E. of the Niger, Idanre being the first place to be known W. of the river.

The specimens cited above enable the description of *P. talbotii* to be amplified in several points. Wernham (*l.c.*) described the stipules as entire, but an isotype of *Talbot* 1054 at Kew shows the larger stipules to be clearly bicuspidate. The linear leaves of the original are exactly duplicated by 8641, but the other gatherings show that the lamina may often be considerably broader and elliptic-lanceolate. Wernham compared *P. talbotii* with *P. recurva* Hiern, but, while these two are certainly not distant relatives, it seems to me that *P. talbotii* has an obviously closer affinity with *P. calva* Hiern, from which it differs in its usually narrower more attenuate leaves and in the fewer (about 3–5) more ascending lateral nerves. Both *P. talbotii* and *P. calva* agree in possessing bacterial nodules and in their position, which is along the midrib. The nodules in the isotype of *P. talbotii* are difficult to see, but a careful examination discloses them towards the base of the midrib ; in the Idanre gatherings cited they are very conspicuous, showing (when dry) as blackish lines. *P. talbotii* must thus be added to Dr. Bremekamp's list of the bacteriophilous species of *Psychotria* in Journ. Bot. **71,** 271–280 (1933).

The points in which Wernham's original description of *P. talbotii* may be altered or amended are as follows :—

Frutex usque ad 2 m. altus. Folia saepe coriacea, lineari-lanceolata usque elliptico-lanceolata et 4·8 cm. lata, subtus prope costam nodulis bacteriorum linearibus plus minusve nigrescentibus notatum. Stipulae usque ad 1 cm. longae, bicaudatae vel integrae. Fructis carnosus, globosus, 6–8 mm. diametro, ruber, pedicello incrassato rubro circiter 3 mm. longo suffultus.

VERBENACEAE

Stachytarpheta. In endeavouring to name a gathering of this genus from Idanre I found the current classification so unsatisfactory that it was necessary to re-examine all the West African material.

The most recent treatment as far as our area is concerned is that of Hutchinson and Dalziel in Fl. W. Trop. Afr. **2,** 277 (1931), recognising, on leaf-shape alone, two species— *S. jamaicensis* Vahl with *S. indica* Vahl as a synonym, and *S. angustifolia* Vahl. Within the area of the Flora there are, however, three perfectly distinct species which should be easily identifiable by the following key :—

Calyx, when seen from the anticous side, showing four prominent teeth at apex, the two central ones equalling in length or rather shorter than the laterals. Leaves broad, ovate to elliptic or oblong-elliptic ; teeth on the well developed cauline leaves comparatively close and numerous, 11–18 on each margin, rarely as few as 10. Corolla with white centre :

Plant shrubby, with woody stems. Spikes almost always sparsely but distinctly pubescent. Corolla small, white or with pale blue tinge on the lobes, tube about 4–5 mm. long, scarcely exceeding the calyx, lobes about 1·5 mm. long *S. cayennensis* (L. C. Rich.) Schau.

Plant herbaceous. Spikes glabrous. Corolla much larger, deep blue with white centre, tube about 10 mm. long, considerably exceeding the calyx, lobes about 3 mm. long *S. indica* (L.) Vahl

Calyx, when seen from the anticous side, appearing bifid at apex, the two central teeth reduced to small inconspicuous denticles on the side of the much larger lateral teeth. Leaves narrow, oblanceolate to linear-oblanceolate ; teeth on the well developed cauline leaves coarse distant and few, 4–9 on each margin, rarely as many as 10. Corolla pale blue without a white centre. Plant herbaceous, rather fleshy . . . . . . *S. angustifolia* (Mill.) Vahl

1. **Stachytarpheta cayennensis** (L. C. Rich.) Schau. in DC., Prod. **11,** 562 (1847) et in Mart., Fl. Bras. **9,** 199 (1851) (both as *Stachytarpha*) ;

Danser in Ann. Jard. Bot. Buitenz. **40,** 2 (1929) ; Moldenke in Pulle, Fl. Suriname, **4,** 274 (1940).

Verbena cayennensis L. C. Rich. in Act. Soc. Hist. Nat. Paris, **1,** 105 (1792).

Stachytarpheta cajanensis Vahl, Enum. Pl. **1,** 208 (1805).

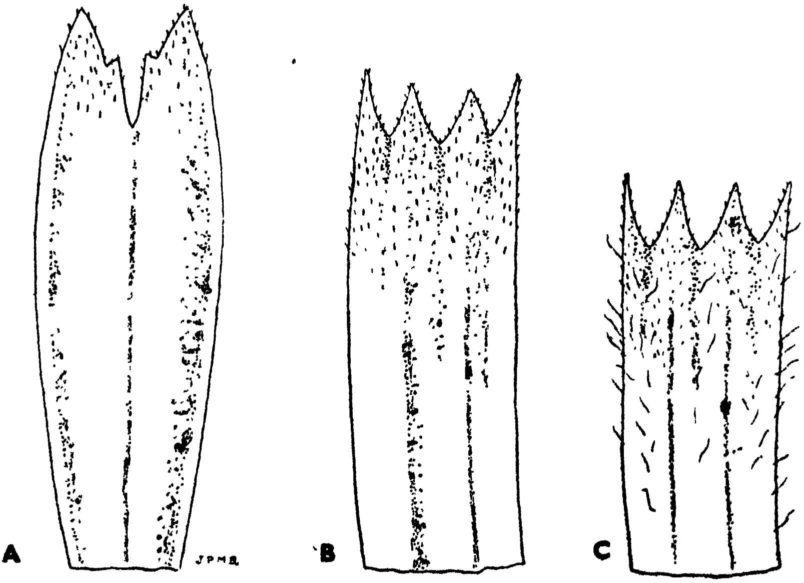
Stachytarpha cayanensis Link, Enum. Pl. Hort. Bot. Berol. **1,** 18 (1821).

[*Stachytarpheta indica* (non (L.) Vahl) Baker in Thiselton-Dyer, Fl. Trop. Afr. **5,** 284 (1900), p.p. quoad *Scott Elliot* 4162].

[*Stachytarpheta jamaicensis* (non (L.) Vahl) Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 277 (1931), p.p. quoad spec. cit. *Scott Elliot* 4162, *Dawodu* 364, *Dennett* 502].

SIERRA LEONE. Sierra Leone, 1891, *G. F. Scott Elliot* 4162 (K) :—shrub 2 m., with white flowers, common in waste places. Freetown, 4 June 1933, *F. C. Deighton* 2716 (K) :—common weed 1 m. high or up to 1·2 m. or even more when straggling by hedges ; much branched, branches and spikes diverging and not becoming erect as in 2715 [*S. angustifolia*] and 2545 [*S. indica*] ; smaller leaves than 2545 from which plant is is always readily distinguishable even at a distance ; distribution of 2545 and 2716 is different. Kenema, 23 Apr. 1946, *F. C. Deighton* 4291 (K) :—common weed round towns ; a woody undershrub up to 1 m. high ; flowers rather pale blue shading to white in the centre.

NIGERIA. Lagos, *J. Dawodu* 364 (K). Lagos, 2 June 1909, *R. E. Dennett* 502 (K) :—a shrub about 1 m. high. Lagos 23 Jan. 1919, *Dr. J. M. Dalziel* 1393 (K) :—a weed of waste ground : vernacular name (Yoruba) “ àgógó ìgún ”. Lagos, 19 Dec. 1927, *O. Hagerup* 803 (K) :—



Calyces of *Stachytarpheta* spp. seen from the anticous side, all × 10 ; the small fifth posticous calyx-tooth is on the further side of the compressed calyces, and is not visible.
A. *Stachytarpheta angustifolia* (Mill.) Vahl.
B. *Stachytarpheta indica* (L.) Vahl.
C. *Stachytarpheta cayennensis* (L. C. Rich.) Schau.

1 m. high ; flowers pale blue. Oyo Province, Ibadan Division : Ibadan, Dec. 1935, *R. J. Newberry* 134 (K) :—shrub with light blue flowers : vernacular name (Yoruba) " agogo-ogun ". Ondo Province, Akure Division : Weed by path between the rest-house and the village, Idanre, alt. c. 450 m., 4 Jan. 1948, *J. P. M. Brenan* 8709 (K, FHI, BM, P, CA) :— slender-stemmed shrub to c. 1·5 m. high, much branched above ; young stems green, older pale grey ; leaves mid-green above, with very impressed nerves and veins, almost bullate ; corolla small, white, with pale blue tinge on the lobes. Calabar Province, Eket Division : Eket District, 1912–13, *Mr. and Mrs. P. A. Talbot s.n.* (K).

S. cayennensis is native to the tropics of the New World, where it has a wide distribution ; it has also been introduced to parts of the Old World but has not hitherto been recorded from Africa.

I am indebted to the kindness of the Director of the Conservatoire et Jardin Botanique at Geneva who courteously sent on loan the type-specimen of *Verbena cayennensis* L. C. Rich., collected by Le Blond from French Guiana. This specimen closely resembles what has been interpreted as *S. cayennensis* in S. America, except that the inflorescence-axes and calyces lack the longer crisped hairs normally seen in *S. cayennensis*. Although I have not found a precise match, as far as the indumentum is concerned, for Le Blond's specimen among the S. American material of *S. cayennensis* at Kew, I certainly do not consider the slight difference to be specific, and therefore maintain *S. cayennensis* in its customary sense.

Richard's original spelling of the epithet was " *cayennensis* " and this must be retained. My colleague Mr. E. Milne-Redhead has kindly pointed out that Vahl, to whom the combination under *Stachytarpheta* is usually attributed, spelt the epithet " *cajanensis* "—a version so different from the original as in effect to constitute a new name, and a quite unjustified one. Link's later " compromise "—" *cayanensis* "—does not affect the problem. The binomial *Stachytarpheta cayennensis* is therefore here attributed to Schauer, who was the first to transfer Richard's epithet to *Stachytarpheta*.

The original spelling of the genus was *Stachytarpheta*. Link's emendation of this to *Stachytarpha*, though perhaps a philological improvement, cannot be upheld under the Rules. Although Schauer used *Stachytarpha*, this is clearly only an orthographic variant of the original which can be corrected without alteration of the authority.

2. **Stachytarpheta indica** (L.) Vahl, Enum. Pl. **1,** 206 (1805) ; Baker in Thiselton-Dyer, Fl. Trop. Afr. **5,** 284 (1900), p. max. parte, excl. *Scott Elliot* 4162 ; Danser in Ann. Jard. Bot. Buitenz. **40,** 5 (1929).

[*Stachytarpheta jamaicensis* (non (L.) Vahl) Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 277 (1931), p.p. quoad *Vogel* 30, *Mann* 89, *Scott Elliot* 3833, *Johnston s.n.*]

SIERRA LEONE. Very common all round Sierra Leone, 1891–2, *G. F. Scott Elliot* 3833 (K). Makumri, alt. 110 m., 15 June 1914, *N. W. Thomas* 532 (K) :—vernacular name (T.) " egbedi ". Mabum, alt. 110 m., 19 Aug. 1941, *N. W. Thomas* 1566 (K) :—on a sandy beach, a variety with somewhat fleshy leaves ; this form with large deep blue flowers and dark green leaves is common inland. Weed at Njala, 27 Oct. 1932, *F. C. Deighton* 2545 (K) :—bushy, 0·6–1 m. high, with deep blue flowers. Rokupr, 19 Feb. 1946, *F. C. Deighton* 4173 (K) :—on upland above a tidal marsh ; leaves deep green ; flowers deep blue with a white centre.

LIBERIA. Liberia, without precise locality, 1906, *Sir. H. Johnston s.n.* (K). Monrovia, 19 Nov. 1926, *D. H. Linder* 1567 (K) :—a weed in streets with blue flowers.

GOLD COAST. Cape Coast Castle, *Vogel* 30 (K). Axim, 30 Dec. 1911, *T. F. Chipp* 48 (K) :—a blue flowered herb. Ankobra Junction, 20 Feb. 1928, *Sir. E. A. Kitson s.n.* (K).

NIGERIA. Calabar Province, Calabar Division : Old Calabar, 22 Jan. 1897, *J. H. Holland* 15 (K) :—flowers small, blue. Oban, 1911, *P. A. Talbot* 307 (K). Oban, 1911–2, *Mr. and Mrs. P. A. Talbot s.n.* (K).

FERNANDO PO. December 1859, *G. Mann* 89 (K) :—herbaceous plant 1 m. high ; flowers blue.

Hutchinson and Dalziel make *S. indica* (L.) Vahl a synonym of *S. jamaicensis* (L.) Vahl, in my opinion wrongly. For the distinctions between them, reference should be made to the descriptions and plates by Danser in his account of the genus in Ann. Jard. Bot. Buitenz. **40,** 1929. According to Danser's definition, the true *S. jamaicensis* does not occur in West Africa at all, though both it and *S. indica* are in East Africa.

3. **Stachytarpheta angustifolia** (Mill.) Vahl, Enum. P. **1,** 205 (1805) ; Baker in Thiselton-Dyer, Fl. Trop. Afr. **5,** 284 (1900) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 277 (1931).
   Verbena angustifolia Mill., Gard. Dict., ed. 8, no. 15 (1768).

The distribution of this species and the specimens cited in the Fl. W. Trop. Afr. are accurate, so that a repetition here is unnecessary. One of the specimens cited there under *S. jamaicensis*—*Dawodu* 224, from Lagos—is *S. angustifolia.*

The type-specimen of *Verbena angustifolia* Mill., sent by Houston from La Vera Cruz, is in the British Museum Herbariu, where I have examined it. It is obviously conspecific with our African plant, and I can match it very satisfactorily with gatherings from Sierra Leone. It seems likely that *S. angustifolia,* alone of the three species dealt with here, is native in Africa.

Danser, in the paper in Ann. Jard. Bot. Buitenz. **40** (1929) already referred to, records hybrids of *S. cayennensis* and *S. indica,* as well as others involving *S. jamaicensis.* Hybrids in this genus have not been recorded in Africa, but botanists will do well to look out for them.

In conclusion special acknowledgment should be made to Mr. F. C. Deighton, Agricultural Department, Sierra Leone, who has realised for some years that three different Stachytarphetas occurred in Sierra Leone, and sent to Kew excellent material, dried and in spirit, to back up his opinion.

MORE NEW PLANTS FROM THE IDANRE HILLS, NIGERIA.

J. P. M. Brenan.

While naming the collections made by the Cambridge Expedition at Idanre, I took the opportunity of naming some others from the same area, mainly made by Messrs. R. W. J. Keay and C. F. A. Onochie, among which are the following novelties.

My colleague Mr. R. D. Meikle has kindly contributed an account of a new *Eriocaulon.*

Melastomataceae

Dissotis rotundifolia (*Sm.*) *Triana* var. **fruticosa** *Brenan,* var. nov. ; ab aliis formis *D. rotundifoliae* sens. lat. habitu fruticoso erecto usque ad 1·5 m. alto crebre ramoso distat. Praeterea foliorum forma et indumento ei formae cui nomen olim *D. prostrata* (Thonn.) Triana valde propinqua sed foliis supra densius strigosis.

Ondo Province, Akure Division : Idanre Hill, below Carter's Peak and S. of the rest-house, 20 Oct. 1946, *R. W. J. Keay and C. Onochie in Forest Herbarium, Ibadan,* 20246 (Herb. Ibadan) :—small erect shrub growing with *Trilepis* (*Catagyna*) ; young stems red ; fruit pale green with red spots. Carter's Peak, 24 Oct. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan,* 22583 (Herb. Kew.) :—in *Trilepis* mats on lower slope of granite hill just above the forest ; much branched, shrubby perennial ; young stems pink, older ones grey-brown ; leaves white beneath ; flowers pale pink, open in morning. Ondo Division : About 3 miles E. of Ondo, N. of the Akure road, 21 Sept. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan,* 22569 (typus varietatis in Herb. Kew., Herb. Ibadan) :—on rocky slope with *Coleus* (22561) and *Cyanotis lanata* at margin of forest tongue ; erect much branched shrub about 1·5 m. high ; stems, petioles and the nerves of the leaves dark pink ; lamina glaucous beneath, dark green above ; calyx pale green ; petals pale pink, about 2–3 cm. long.

Dissotis rotundifolia (Sm.) Triana, as at present interpreted, is a disturbingly variable species especially in habit, including erect shrubs such as the present variety and prostrate herbs rooting at the nodes. There is probably a good deal to be said for returning to the older idea and separating *D. prostrata* (Thonn.) Triana, at least varietally. *D. prostrata,* as far as West African material is concerned, is separable from *D. rotundifolia* by the leaf-shape and absence of spreading hairs on the petiole, but even these characters, admittedly not very profound ones, seem to collapse in East Africa.

At present it seems worth while to separate the above Nigerian specimens as a new variety, since they are distinguishable from other forms of *D. rotundifolia* and hang well together among themselves in habit, leaf-shape and indumentum. The new variety seems to be confined to rocky hills. Seeds of this were brought back to Kew from Idanre and living flowering plants were thus available when the description was drawn up.

RUBIACEAE

Neobaumannia hedyotoidea (*K. Schum.*) *Hutch. et Dalz.* var. **longipila** *Brenan*, var. nov. ; a planta typica caulibus foliisque pilis longioribus flexuosis patentibus nec appressis differt.

Ondo Province, Akure Division : Akure Forest Reserve, on the " Big Stone ", 28 Oct. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan*, 22664 (Herb. Kew.) :—in *Trilepis* and *Loudetia* mats ; erect shrub to 1·2 m. high with fleshy stems and open branching ; bracts white ; corolla blue. On rocks near summit of Carter's Peak, Idanre, 18 Apr. 1943, *C. F. Symington in Forest Herbarium, Ibadan*, 3377 (Herb. Ibadan & Imp. For. Inst., Oxon.): —dwarf shrub ; stems semi-succulent ; flowers not seen. Carter's Peak, Idanre, on deeper soil among *Trilepis* mat on smooth granite slope, 20 Oct. 1946, *R. W. J. Keay & C. F. Onochie in Forest Herbarium, Ibadan*, 21561 (Herb. Ibadan) :—fleshy, almost herbaceous shrub 1·2 m. high ; stems dull purple ; flowers white, tinged pale blue. Carter's Peak, Idanre, in *Trilepis—Hymenodictyon* clumps, 24 Oct. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan*, 22586 (typus varietatis in Herb. Kew.) :—erect shrub to 1·5 m. high with fleshy stem ; bracts white ; corolla blue.

Typical *N. hedyotoidea* has its indumentum all short and appressed, while the new variety has the leaves and stems more or less plentifully clad with longer flexuous hairs which are spreading. On the stems of the new variety short appressed hairs occur plentifully in addition to the longer spreading ones.

The var. *longipila* is apparently restricted to rocky granitic peaks in Ondo Province in Southern Nigeria, to the exclusion here of the typical plant which is only known from the Bauchi Plateau well away to the north, and from the Gold Coast and Togo. The new variety certainly seems well-marked and geographically separated, though I can find nothing beyond the indumentum to separate it from the typical plant.

Neobaumannia has dimorphic flowers, each plant apparently producing flowers of only one kind. Of the flowering specimens of var. *longipila,* 21561 and 22586 have exserted styles and included stamens, and 22664 has exserted stamens and included styles. Of three different gatherings of the typical plant from the Bauchi Plateau, all have exserted stamens.

CONVOLVULACEAE

Ipomoea (§ Leiocalyx) **stenobasis** *Brenan*, sp. nov. ; ut videtur *I. repenti* Lam. inter species africanas proxima, caulibus petiolisque gracilioribus, foliis apice saepe angustatis subtus conspicue glanduloso-punctatis, corollis minoribus, tubo basi insigniter angusto superne abruptius ampliato facile distinguenda.

Herba late repens, caulibus prostratis leviter angulatis 2–3 mm. diametro pilis numerosis albidis brevibus e caule apud nodos unilateraliter exorientibus exceptis glabris vel nonnunquam omnino glabris internodiis 4–15 cm. longis. *Folia* tenuiter papyracea, late cordata, circiter 4–9 cm.

longa et lata, integra, apicem obtusum et breviter mucronatum versus breviter angustata vel nonnunquam acuminata, basi sinu aperto 1·5–5 cm. lato circiter 0·7–1 cm. alto, supra pilis minimis brevissimis praesertim in nervis dispersis nonnisi sub lente cernendis inconspicue puberula, subtus glabra ; costa et nervi laterales utroque costae 6–7 (nervis basalibus utrinque 3–4 inclusis) supra prominuli, subtus satis prominentes et conspicui, rete venularum supra aegre cernendo subtus conspicuo ; lamina subtus sub lente visa glandulis minutis numerosissimis subnigris dense punctata ; petiolus elongatus tenuis, 5–10·5 cm. longus, in statu sicco usque ad 1 mm. diametro, glaber, supra anguste canaliculatus. *Inflorescentiae* axillares, 3–5-florae vel nonnunquam depauperatae uniflorae, pedunculis glabris satis validis 2–7 cm. longis suffultae ; pedicelli 1·3–3·2 cm. longi ; bracteolae minimae, circiter 2–5 mm. longae, caducissimae. *Calyx* ambitu ellipsoideus, glaber, circiter 9–12 mm. longus, 5–6 mm. latus ; sepala 2 exteriora crassa, pallida, elliptica, convexa, 9–11 mm. longa, explicata circiter 7 mm. lata ; sepala 3 interiora paullum majora ; omnia apice rotundata. *Corolla* infundibuliformis, 3·5–5 cm. longa, pallide roseo-purpurea ; tubus circiter 2·5–3·5 cm. longus, extra glaber, parte basali circiter 5–10 mm. longa insigniter angusta circiter 2–2·5 mm. diametro ; limbus patens, circiter 3 cm. diametro. *Staminum* filamenta 5–9 mm. longa, parte libera glabra sed ubi ea cum tubo corolla conjuncta est pubescentia ; antherae oblongae, 2 mm. longae. *Ovarium* glabrum, circiter 1 mm. altum, in stylum filiformem 2·5 cm. longum angustatum ; stigma parvum, capitatum, pilis plumosis radiatum. *Capsula* (e spec. *Chandler* 983, *Maitland* 206 descriptum) subglobosa, circiter 1·5 cm. diametro, brunneo-straminea, longitudinaliter venosa, apice in apiculum circiter 5 mm. longum abrupte angustata. *Semina* brunnea, ellipsoidea vel plus minusve trigona, 7–8 mm longa, 5–6 mm. lata, praesertim prope hilum plus minusve pilosa.

NIGERIA. Ondo Province, Akure Division : Idanre Hills, on rocks by Idanre Rest-house, 31 Oct. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan*, 22674 (Herb. Kew.) :—herbaceous creeper, spreading out from the bush on to bare rock slabs ; flowers magenta-pink.

UGANDA. Eastern Province, Teso District : Serere, near damp but not swampy areas, alt. 1100 m., Dec. 1931, *P. Chandler* 268 (Herb. Kew.) :—flowers pale mauve tinted. Agu Swamp, close to banks of swamp, alt. 1070–1080 m., Sept. 1932. *P. Chandler* 983 (Herb. Kew.) :—height several feet ; flowers pale magenta. Buganda Province, Mengo District : Entebbe, alt. 1186 m., Nov. 1922, *T. D. Maitland* 577 (typus in Herb. Kew.) :—a robust spreading plant, but does not climb readily ; vernacular name " kimonde monde ", because of its resemblance to the sweet potato " lumonde " (*Ipomoea batatas*). Province and district ? Victoria Nyanza region, *T. D. Maitland* 206 (Herb. Kew.).

This species has sometimes been misidentified with *I. repens* Lam., and the two certainly have a good deal in common. *I repens*, at any rate on the herbarium sheet, has a rather coarse and succulent look about it, while *I. stenobasis* is more slender and graceful. The most satisfactory difference is in the shape of the corolla : the tube of *I. repens* broadens immediately above the base and by the time it has got above the sepals it is

(from pressed specimens) 7–10 mm. wide ; in *I. stenobasis* the tube does not broaden at all at the base, but remains only about 2–2·5 mm. in diameter for about 5–10 mm. above the base, and this narrow part sticks out beyond the calyx ; and then above this the tube gradually enlarges. Another useful point is the much more conspicuous glandular dotting on the lower side of the leaves ; faint dots are certainly visible at times in *I. repens*, but not approaching in clarity those of *I. stenobasis*. The more pointed apex of the leaves of the latter will serve as further confirmation.

The distribution of *I. stenobasis* is not as odd as it seems, since the extension as far east as Uganda of a flora with marked similarities with that of West Africa is now a well-known fact. I think is a safe bet to prophesy that *I. stenobasis* will turn up in the lands between Uganda and Nigeria.

A collection of seeds which *may* (there is doubt about it) come from the Nigerian plant shows decided differences from Uganda seeds. If these differences prove to be genuinely within *I. stenobasis*, then it may be necessary to separate the Nigerian plant as a var., but not in my opinion more, as the Nigerian and Uganda plants are vegetatively and florally the same. The description of the seeds is drawn up entirely from the Uganda specimens.

Labiatae

Solenostemon monostachyus (*P. Beauv.*) *Briq.* var. **marrubiifolius** *Brenan*, var. nov. ; a planta typica foliorum pagina superiore breviter sed dense subtomentosa necnon arcte areolato-bullata, inferiore praesertim in nervis albido-tomentosa valde distincta.

Herba erecta, usque ad 45 cm. alta vel nonnunquam fere prostrata. *Folia* rotundato-ovata, circiter 2–4·5 cm. longa et lata, apice obtusa, basi in petiolum abrupte decurrentia. *Inflorescentiae* elongatae usque ad 37 cm. longae, verticillastris inferioribus fructiferis circiter 1–2·5 cm. inter sese distantibus. *Corollae* 1·4 cm. longae, saturate rubro-purpureae.

Ondo Province, Akure Division : Growing among *Trilepis* below Carter's Peak and south of the rest-house, Idanre, 20 Oct. 1946, *R. W. J. Keay and C. F. Onochie in Forest Herbarium, Ibadan*, 20244 (Herb. Ibadan) :—erect herb up to 45 cm. high ; stems pale below and purple at apex where they form the inflorescence-axes ; corolla and stamens deep lilac. Carter's Peak, Idanre, among and at the edge of *Trilepis* mats, 24 Oct. 1948, *R. W. J. Keay in Forest Herbarium, Ibadan* 22585 (typus varietatis in Herb. Kew.) :—erect herb, sometimes almost prostrate when extending from *Trilepis* mat out onto bare rock ; flowers deep mauve.

This is an extremely distinct variety, and it is only after some havering that I have described it as a var. rather than a new species. The very striking bullate appearance of the upper surface of the leaf with the rather coarse indumentum split up by channels into little areoles, together with the coarser whitish tomentum on the lower side, is most distinctive ; but that seems to be all, except for slightly coarser pubescence on the inflorescence. The plant described by Chevalier in Journ. de Bot. **22**, 121 (1909) as *S. graniticolus* provides a connecting link between var. *marrubiifolius* and the normal run of *S. monostachyus*, having the leaves ± bullate above but with finer indumentum making the areolation less distinct, and with an acute apex to the leaf. *S. graniticolus* was sunk as a mere synonym under *S. ocymoides* by Hutchinson and Dalziel, Fl. W. Trop. Afr. **2,** 290 (1931), and I agree thst *S. graniticolus* should not stand as a distinct species on the present evidence. But it is a reasonably good variety, and I propose the following new combination : *Solenostemon monostachyus*, (P. Beauv.) Briq. var. **graniticolus** (*A. Chev.*) *Brenan*, comb. et stat. nov.

But even after this var. has been carved out of *S. monostachyus* a far from homogenous residue is left behind. There is still a disturbing amount of variation in such things as leaf-shape, density of inflorescence, and especially size of corolla. I think that it is quite on the cards that the correct eventual way of dealing with *S. monostachyus* will be to recognise a number of microspecies under it. In the meantime more observation in the field is what is wanted.

ERIOCAULACEAE

Eriocaulon nigericum *Meikle*, sp. nov. *E. hanningtonii* N.E. Br. affine, sed foliis latioribus subobtusis, capitulis obscure pubescentibus, bracteis involucralibus fuscis nec stramineis differt.

Herba annua, rosulata, caulis prebrevis. *Folia* late linearia vel ligulata, 15–30 mm. longa et 2–6 mm. lata, 16–20-nervia, apice obtusa vel abrupte acuta, glabra, subspongiosa, obscure fenestrata, in sicco olivacea ; vaginae foliis breviores, usque 20 mm. longae, parte superiore laxae, glabrae, apice membranaceae, scariosae, in lobos 2 vel 3 irregulariter fissae. *Pedunculi* 5–20, folia longe superantes, circiter 20–100 mm. longi, glabri, 6-costati, costis leviter tortis. *Capitula* depresso-globosa, circiter 3–4 mm. diametro, brunneo-fusca, sub lente distincte pubescentia ; bracteae involucrales late obovatae, circiter 2 mm. longae et 1·3 mm. latae, concavae, glabrae, apice obtusae, parte inferiore stramineae, parte superiore griseo-fuscae ; bracteae flores stipantes anguste obovatae, circiter 1·5 mm. longae et 1·0 mm. latae, apice obtusae vel subacutae, concavae, parte superiore fuscae, summitate pilis albis perpaucis ornatae. *Receptaculum* longe pilosum. *Flos* ♂ breviter pedicellatus ; sepala 3, circiter 1 mm. longa, usque ad medium in tubum connata, apice acuta, parce pilosa, parte superiore fusca subglabra ; corollae tubus angustus, usque 0·5 mm. longus, pallidus, apice in lobos 3 minutos eglandulosos divisus ; antherae 6 subglobosae, circiter 0·25 mm. diametro, nigrae. *Flos* ♀ distincte pedicellatus ; sepala 3 libera, subaequalia, circiter 1·5 mm. longa et 0.8 mm. lata, carinata, dorso paullo gibbosa, fusca, albo-pilosa, apice acuta, recurvata ; petala 3 subaequalia, lanceolata, usque 1·8 mm. longa et 0·6 mm. lata, eglandulosa, parte superiore fusca, summitate pilis albis perpaucis ornata ; ovarium circiter 0·5 mm. diametro, pallide brunneum ; stylus circiter 0·2 mm. longus, supra in stigmata 3 filiformia usque 1 mm. longa divisus. *Semina* ovoidea, usque 0·3 mm. longa et 0·2 mm. lata, fulva, papillosa.

NIGERIA. Ondo Province, Akure Division : Idanre, about 490 m. alt. above the old village, 25 Aug. 1946, *A. P. D. Jones in Forest Herbarium, Ibadan* 20718 (typus in Herb. Kew.) :—In a close grassy sward in a damp flush at the head of a ravine. With terrestrial *Utricularia*, *Drosera indica* and small sedges in a closely felted peat.

A NEW BRACHIARIA FROM BURMA

N. L. BOR

Brachiaria burmanica *Bor*, spec. nov., *B. subquadriparae* (Trin.) Hitch. similis sed ab ea spiculis multo majoribus, lanceolato-ellipticis haud elliptico-oblanceolatis, pilis brevibus aureis tectis recedit.

Gramen annuum. *Culmi* usque 40 cm. alti, laeves, glabri sed infra paniculam dense puberuli, teretes, vaginis tecti, striati, nodis hirsutissimis. *Foliorum laminae* elliptico-acuminatae vel lanceolato-elliptico-acutae, planae, 3–5 cm. longae, circiter 1 cm. latae, in apicem validum attenuatae, utrimque pilis albis basi papillosis obsitae, multi-nerves, marginibus cartilagineis scabrae, basi rotundatae ; *vaginae* culmum complectentes, striatissimae, pilis basi papillosis hirsutae ; *ligulae* angustissimae, membranaceae.

Racemi 3–5, patentes ; rhachis applanata, glabra ; *spiculae* imbricatae, pedicellis 1 mm. longis pilis albis nonnullis instructis fultae, 3·5 mm. longae, 1·5–1·75 mm. latae, lanceolato-elliptico-acutae ; *gluma inferior* 2 mm. longa, 2·5 mm. lata, late ovata, acuta, 7-nervis, apicem versus minute puberula ; *gluma superior* 3·5 mm. longa, lanceolato-elliptico-acuta, 7-nervis, dorso omnino pilis brevibus albis vel aureis e tuberculis ortis tecta. *Anthoecium inferius* vacuum ; *lemma* 3·5 mm. longum, anguste elliptico-acutum, 5-nerves, dorso omnino pilis brevibus aureis tectum ; palea abest. *Anthoecium superius* ☿ ; *lemma* 3 mm. longum, late ovato-ellipticum, obtusum, dorso transverse rugosulum, chartaceum, 3-nerve ; *palea* similis ; *stamina* 3 ; *antherae* 1·5 mm. longae.

BURMA : Rangoon, beside Godwin Road, 20 Jun. 1948, *U. Thein Lwin* 526 (Typus in Herb. Kew.) Tatgyigon Grazing Ground, 28 Jun. 1947, *ibid.* 109 ; Prome Distr., beside P.W.D. Road, 21 Jul. 1948, *ibid.* 587.

NOTES ON THE GENUS BERSAMA IN AFRICA

B. VERDCOURT

Few genera are in such a state of confusion as the genus *Bersama* Fres.[1]. Three species are dealt with in the Flora of Tropical Africa (1868), whilst at the present time the number of published names is nearly 60. This twentyfold increase is due mainly to the efforts of E. G. Baker[2], Gürke, Gilg[3] and von Brehmer[3]. The latter two authors arew ell known to have had extremely narrow views on the limits of species and a complete inability to understand that some species are remarkably polymorphic, though their descriptions were usually full and accurate. E. G. Baker also had similar views on species, and his descriptions were not always adequate. All the authors have frequently described new species from quite inadequate material and very often from single specimens only. Engler[4] published a brief synoptic key to the species of the genus but he used quite unworkable characters : some which vary on one individual, e.g. nature of leaflet margins ; others which are quite imaginary, e.g. the shape of the stigma in those species which have a globose stigma. His key is not even complete, for it omits one of the three species described in the Flora of Tropical Africa. Phillips[5] has dealt with the South African species.

The confusion in the genus is not however solely the result of indifferent work, it is also due to something intrinsic in the genus. It is one of those genera which is very probably not capable of treatment by classical taxonomic methods. Many people have attempted this and found it impossible. The various characters although frequently very constant for a given individual show no correlation. Scarcely two individuals are alike. The wider the geographical area considered, the more marked does this lack of correlation become. It is little wonder that botanists with narrow specific concepts described so many species. The explanation for this state of affairs is not easy to discover by work in the herbarium. The genus may be apomictic ; it is certainly one which invites cytological investigation. It seems likely that the main centre of the genus was originally in South Africa, where the species are more distinct, from whence a very rapid spread north took place. Coupled with the fact that the population of individuals was sufficiently scattered, intense local apparent speciation is occurring. The species are still in the making. The result is that it is impossible to name *Bersama* specimens at the present time. Most of the names on herbarium sheets are guesses, usually put down in sheer desperation after trying to match the specimens and failing. The majority of sheets are however just labelled "*Bersama* sp." It is obvious that if this state of affairs is to come to an end a drastic step must be taken. The author has come to the firm conclusion that a large number of the proposed species should be treated as a single aggregate species which is genetically very variable—*B. abyssinica* Fres. Until some such proposal is accepted by botanists it will not be possible to provide reliable names for any material of *Bersama*. The alternative proposal of naming every form which comes to hand, although appealing to some botanists, is a futility unworthy of science.

The writer has taken the step in this present paper which is but a very preliminary treatment. No attempt is made to name the varieties or monograph the genus. A description of the kind of variation which is taking place is given on a geographical basis but the writer does not intend to provide varietal names until the genus has been more thoroughly studied in the field and much fuller information is available concerning behaviour in different habitats, appearance of the different stages of growth, amount of variation within a population, and chromosome numbers. This course may be considered unsatisfactory by many but in the writer's opinion it is better than the chaos which has prevailed during the past 30 years. It seems better to wait for a few years than to propose a new scheme of classification which further field work is bound to modify.

The study of the genus is complicated by the fact that very many of Gilg and von Brehmer's types (and also some of Gürke's) at Berlin were destroyed during the war. It was feared that Rüppel's specimen of *B. abyssinica* Fres. (the type) had also been destroyed at Frankfurt, but the collections at the Senckenberg Museum were not so badly damaged as was at first believed. The writer has been able to examine this type through the kindness of Prof. Dr. R. Kräusel, Keeper of the Botanical Department of that institution. It is a good specimen and shows clearly that *B. abyssinica* is a form with an annular or almost entire disc, and non-alate leaf-rachis. *Schimper* 1507, a sheet which has been widely distributed, is clearly conspecific and may be taken as an authentic specimen.

It is perhaps worth pointing out here that the family diagnosis of Melianthaceae given by Hutchinson[6] is inaccurate in certain details. Hutchinson states that the disc is unilateral and gives the number of stamens as 4. In reality the disc is frequently annular and the number of stamens varies from 4–6.

The writer's conclusions have been reached after study and dissection of all the material in the herbaria of the following institutions. East African Agricultural and Forestry Research Organisation, Amani, Tanganyika ; Forestry Department, Entebbe, Uganda ; and Royal Botanic Gardens, Kew. The following characters have been particularly noted.

1. Leaves
   (a) size and shape of leaflets, (b) winging of rachis, (c) number of leaflets, (d) margin of leaflets, (e) indumentum, (f) length of petiolules.
2. Length and indumentum of inflorescence.
3. Size of flowers and length of pedicels and bracteoles.
4. Sexuality of the flowers.
5. Shape and indumentum of the calyx.
6. Stamens :—number and degree of connation.
7. Shape of the disc.

It was found that the majority of these characters were, so far as could be made out from herbarium material, constant for a given individual, but field work is necessary and it would be most helpful if future collectors would pay attention to the characters mentioned above. Practically no field notes on these characters are available save for the specimens collected by Welwitsch. The size of the leaf varies within wide limits on one plant. The leaflets may be serrate, deeply toothed or entire on the same plant. The winging of the leaf rachis is more constant but this also shows variation in the individual. The number of stamens also is inconstant in a given individual. In some areas it is very constant, e.g. nearly always 4 in the west, but in others the number varies from 4–6 on the same plant. The degree of connation also varies and the distinction between the sections *Eubersama* and *Natalia* cannot be upheld (Baker[2] agreed that *Natalia* could not be considered as separate genus). There are undoubtedly hermaphrodite forms and functionally female forms. Many of the sheets of gatherings collected in young fruit have these young fruits surrounded by a ring of small stamens. These stamens bear aborted anthers which contain no pollen and do not dehisce. The marked difference in the indumentum of the sexual parts may bear some relation to these forms and cannot be used as characters. Much of the herbarium material is not in the right state to decide upon the sexuality of the flowers. It is for instance difficult to decide if functionally male flowers exist since one has no way of knowing whether the young ovules present will develop or not. The remainder of the characters appear to be constant for a given individual but vary very much from one individual or population to another. These will be noted chiefly in the section discussing the detailed variation of the species, but a few general observations follow.

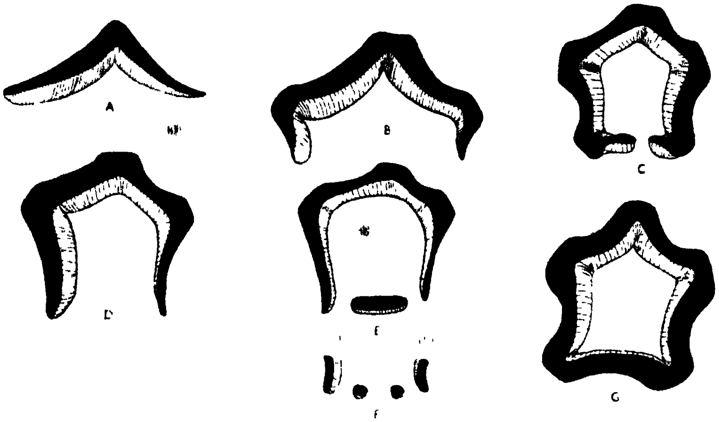


FIG 1. Discs of *Bersama*.

The sepals may be obtuse or rather acute, glabrescent or thickly covered with golden-brown or reddish hairs. The degree of fusion of the two anterior sepals is most variable and is in any case an unsatisfactory character since mechanical splitting easily occurs in dried or drying material. The " strength " of the fusion between the two sepals is often quite low and though they appear quite fused, a slight pull will part them. Great use has previously been made of the presence of 4 or 5 sepals. The inflorescence varies in length and robustness, from 10–40 cm. Flowers vary in size and this again may be linked (as it often is in other genera) with the functional sexuality of the flower. The length of the pedicels and bracteoles varies from 0–1 cm. or in the case of pedicels even more. Some forms (particularly *le Testu* 2055) have lower pedicels about 2·5 cm. long and certainly appear totally distinct from those having sessile flowers. The length of the pedicels varies with the age of the flower and they may be accrescent in some cases. The disc has been used as a character by Engler and it is certainly a character which varies considerably from form to form and appears to be constant for a given form. The writer has used it as a character but he may be entirely mistaken in considering it to be of any importance. Since the range of variation is difficult to describe and has often been described by means of peculiar terms by other authors, a few diagrams are given here (Fig. 1). There is only a slight amount of variation to be found in the disc from adult flowers of the same plant—e.g. forms shown in Fig. l*e* and l*f* or l*c* and l*g* may be found on the same plant. Only very rarely is a completely intermediate, ± 3 lobed disc found (Fig. l*b*), thus showing that even the disc is not a thoroughly reliable character but is more so than most.

The author proposes that the following species should be sunk into the aggregate *Bersama abyssinica* Fres. Where the type has almost certainly been destroyed and no material has been seen a question mark is appended to the name. The descriptions make it clear that the forms concerned come within the conception of the aggregate. The author is as averse to sinking names from descriptions alone as are most botanists. If a few of these names prove to be worthy of recognition they can always be reinstated, but the author has felt that with the present genus a " clean sweep " was the only way out. Some of the names have been cited under varieties but the precise limits of these are uncertain and no new combinations have been made. An indication only has been given of their application. Further field work will define the limits and probably indicate that other names must be reinstated as varieties. No attempt has been made to key out the forms since it is impossible and the result would be entirely without value.

A preliminary classification into two subspecies is here proposed based on disc characters. Some of the forms which are being sunk into the aggregate species cannot be correctly assigned to their subspecies since the material is inadequate or types have not been seen or are not available or descriptions are not adequate. Certain names in each subspecies have been cited as varieties and it is certain that further forms at present placed under the subspecific name will have to be identified with one of these varieties or raised as new varieties. The names immediately following the subspecific names are not therefore all of equal varietal standing. This must be emphasized.

Bersama abyssinica Fres. in Mus. Senckenb. **2,** 281 (1837).

B. coriacea Bak. f. in Journ. Bot. **45,** 15 (1907—material inadequate).

? *B. giuliarelli* Chiov. in Atti R. Acad. Ital. **11,** 26 (1940).

? *B. maschonensis* Gürke in Engl. Bot. Jahrb. **40,** 88 (1907) (possibly = *B. nyassae* Bak. f.).

A subspecies **abyssinica** s. str.

B. chloroleuca Brehm. in Engl. Bot. Jahrb. **54,** 414 (1917). *B. erythrocarpa* Brehm. loc. cit. 395. ? *B. gallensis* Brehm. loc. cit. 403. ? *B. goetzei* Gürke in Engl. Bot. Jahrb. **28,** 424 (1900). ? *B. gracilipes* Mildb. in Notizbl. Bot. Gart. Berl. **11,** 668 (1932). ? *B. hebecalyx* Gilg & Brehm. loc. cit. 414. *B. holstii* Gürke in Engl. Bot. Jahrb. **19,** Beibl. 47, 36 (1894). *B. integrifolia* A. Rich., Tent. Fl. Abyss. **1,** 107 (1847). *B. jaegeri* Gilg & Brehm. loc. cit. 304. ? *B. ninagongensis* Gürke in Wiss. Ergebn. Deutsch Zentr.-Afr.-Exped. 1907–8, **2,** 483 (1912). *B. serrata* A. Rich. loc. cit. 107. *B. suffruticosa* Brehm. loc. cit. 401. ? *B. volkensii* Gürke in Engl. Bot. Jahrb. **19,** Beibl. 47, 36 (1894).

i) subspecies *abyssinica* s. str. var. A

? *B. ussanguensis* Brehm. loc. cit. 400. *B. kandtii* Gilg & Brehm. loc. cit. 402.

B subspecies **paullinioides** (Planchon) comb. nov.

Natalia paullinioides Planch. in Hook. Fl. Nigrit. 252 (1849). *B. paullinioides* Baker in Fl. Trop. Afr. **1,** 435 (1868). *B. andongensis* Welw. ex Hiern, Cat. Welw. Afr. Plants **2,** 174 (1869). *B. angolensis* Bak. fil. Journ. Bot. **40,** 18 (1907). ? *B. bolamensis* Brehm. loc. cit. 396. ? *B. deiningeri* Brehm. loc. cit. 398. ? *B. deneckeana* Brehm. loc. cit. 410. ? *B. faucicola* Gilg & Brehm. loc. cit. 413. ? *B. kiwuensis* Gürke in Wiss. Ergebn. Deutsch Zentr.-Afr.-Exped. 1907–8, **9,** 483 (1912). *B. leiostegia* Stapf in Journ. Linn. Soc. **37,** 92 (1905). *B. lobulata* Sprague & Hutch. in Cat. Pl. Talbot, 21 (1913). ? *B. mildbraedii* Gurke loc. cit. 483. *B. oligoneura* Brehm. loc. cit. 404. ? *B. pachyneura* Gilg & Brehm. loc. cit.407. *B. pachythyrsa* Brehm. loc. cit. 399. *B. pallidinervia* Brehm. loc. cit. 408. *B. preussii* Bak. f. Journ. Bot. **45,** 16 (1907). ? *B. schweinfurthii* Brehm. loc. cit. 405. *B. subulata* Hutch. & Dalz. in Kew Bulletin **1929,** 27 (1929). *B. tessmannii* Brehm. loc. cit. 406. ? *B. xanthotricha* Gilg & Brehm. loc. cit. 397.

i) ssp. *paullinioides* variety A.

B. usambarica Gürke in Engl. Pflanzenr. Ost. Afr. C, 252 (1895).

ii) ssp. *paullinioides* variety B.

B. nyassae Bak. f. in Journ. Bot. **45,** 19 (1907). *B. schreberifolia* Brehm. loc. cit. 411. (This may eventually have to be placed with C).

iii) ssp. *paullinioides* variety C.

B. engleriana Gürke in Engl. Bot. Jahrb. **14,** 307 (1891). *B. leucotricha* Brehm. loc. cit. 409. (These two represent the extremes included here—many of the forms included under *paullinioides* above are probably best placed here, whether the rachis is winged or not).

iv) ssp. *paullinioides* variety D.

B. ugandensis Sprague in Journ. Linn. Soc. **37,** 512. *B. myriantha* Gilg & Brehm. l.c. 412. (*B. kiwuensis* Gürke probably belongs here).

v) ssp. *paullinioides* variety E.
B. maxima Baker in Fl. Trop. Afr. **1,** 434 (1868). (Possibly just a large form of B).

An account of the geographical variation follows and an attempt is made to indicate the application of the above varietal symbols, but only a close study of the actual material can do this properly.

Bersama abyssinica ssp. **abyssinica** s. str. Disc entirely annular or at least 4-lobed (Fig. 1 *c–g*). Leaf rachis nearly always non-alate. Leaflets usually entire and glabrous. Stamens 5, connate at the base. Bracteoles short. Functionally ♀ forms frequent. Fruit small, usually 1–2 cm. long, often grooved and reddish.

WEST AFRICA. The writer has seen no specimens of the genus from this district which had an entire or even a 4-lobed disc.

CAMEROONS & CONGO.

(i) Forms with an entire disc. Leaf-rachis unwinged or very slightly winged on the final internode. Leaflets ± 7 cm. long, reticulate, glabrous, with petiolules 2 mm. long. Flowers small, sessile or very shortly pedicellate. Calyx covered with golden hairs. The forms seen from the eastern Congo (e.g. *Hendrickx* 1381) are very similar to non-alate forms of *paullinioides.*

(ii) Variety A

Form with disc as in Fig. 1*e*. Leaf-rachis slightly winged on the final internode. Leaflets 4–5 cm. broad, coppery brown above in the dried state with a moderate amount of matted yellow hairs beneath. Flowers sessile, calyx thick, densely fulvous-tomentose and hairy. Ruanda, *Kandt* 66.

ABYSSINIA.

(i) Typical *abyssinica*. Disc entire or 4 lobed. Leaf-rachis not winged. Leaves ± 5–6 (average)-jugate. Flowers small ± sessile. Calyx with whitish, yellow or reddish hairs, or often glabrescent (type has few hairs but possibly rubbed). Inflorescence up to 30 cm. long. Fruits small. Very many variations occur in the shape, width, margin and number of leaflets.

UGANDA.

(i) Forms similar to typical *abyssinica* but often with larger entire or dentate leaflets, but still glabrous. Rachis not winged, glabrous. Calyx with yellow-brown hairs. Fruit 1–2 cm., grooved, often pinkish, e.g. *Burtt* 3256, *Dummer* 1411, *Scheffler* 303.

(ii) Similar to (i) but showing resemblance to *holstii* (see Kenya) in long pedicels. Calyx varying in hairiness e.g. *Maitland* 568, *Eggeling* 175, *Thomas* 6, *Eggeling* 5546, *African Staff* comm. *Brassnett* 112.

(iii) A form similar to above but leaflets large up to 16 × 6 cm. Final internode of rachis sometimes broadly alate. Bracteoles 1 mm. long.

Disc usually as in Fig. 1*d* but side lobes frequently quite short (Fig. 1*b*) *Snowden* 953 & 498.

KENYA.

(i) The prevalent form of *abyssinica* to be found in Kenya is equivalent to *B. holstii* Gürke. This has not been retained as a variety at present since there seems to be no end to the intermediates with typical *abyssinica*. Small tree, branches in herbarium material often very lenticellate. Leaves 4–9-jugate, rachis not winged. Leaflets ± (12 × 4) cm., rather oblong, glabrous, entire, and shortly petiolulate. Inflorescence usually long, up to 40 cm., either slender or coarse in appearance. Flowers small, 5–8 mm. long. Calyx reddish brown or purplish in the dry state, usually much less pubescent than in other forms. Sepals rounded. Stamens 4–6, connate (variable on same individual). Disc usually as fig. 1*d* sometimes complete or nearly so (fig. 1*e*, *f* & *g*). Fruit 2 cm. long, grooved, e.g. *Napier* 5342 from Kisii, and *van Someren* 5967 from Katmayo. *Elliott* 371 from Maramanda and *Baker* 325 from Mau are remarkable since they exactly match ! Their peculiar appearance however—elongate flowers and calyces—is due to some pathological condition. The stamens are galled.

TANGANYIKA.

(i) Forms identical with the Kenya form. The type of *B. holstii* Gurke came from Amboni near Tanga, close to the Kenya border. *Holst* 2432, *Porter* 3452 and *Bancroft* 43 from Meru are further examples. *Uhlig* 440. *St. Clair Thompson* 432 is the same galled form as *Elliott* 371 mentioned under Kenya.

(ii) Form near to (i) but with dentate leaves, winged rachis, hairy calyx and an entire disc. *Gillman* 106 from Kiao Island, Bukoba.

(iii) Forms of *abyssinica* with very silky yellow or brown (hairy) calyces. Rachis not winged. Leaflets small, ± elliptic—lanceolate to ovate—lanceolate, up to 10 × 4 cm. Stamens 5. Disc complete or 4 lobed. Rather a miscellaneous group of forms. *Staples* 158, *Greenway* 3092, *Hornby* 492, *Haarer* 1780, etc. *B. suffruticosa* belongs here but the leaves sometimes have a few hairs beneath.

(iv) Variety A. Similar to *Kandt* 66, from Ruanda. Leaf-rachis not winged. Leaflets sessile, ovate to ovate—lanceolate, slightly cordate at the base, entire and coriaceous, densely hairy beneath. Inflorescence, calyx, and leaf-rachis densely covered with yellow and brown hairs. Disc almost complete (as Fig. 1*e*). *Davies* E. 53, Elton Plateau, Livingstone Mountains. This variety is one of the more distinct ones since it is unusual to find correlation between very hairy leaves and an entire or nearly entire disc.

SOUTH TROPICAL AFRICA.

(i) Form close to *B. holstii* Gurke—see Kenya (i). Leaves 7-jugate, sessile, with petiolules 2–3 mm. long. Flowers small. Calyx brownish with less hair than other forms. *Brass* 17797 (Nyasaland).

(ii) Forms rather similar to typical *abyssinica* but with leaves of very various sizes. *Anthony* 17613, *Brass* 16173 (Nyasaland). There is incomplete material from Nyasaland and Northern Rhodesia which belongs here in all probability.

Bersama abyssinica ssp. **paullinioides** (Planch.) Verdcourt. Disc two-lobed (Fig. 1*a*) variable in size. Leaf-rachis not winged or very strongly winged. Planchon figures the leaf-rachis as being strongly winged but the type is only very narrowly so. In the west the two-lobed disc is commonly correlated with a non-winged or narrowly winged rachis, whereas in the east it is commonly correlated with a winged rachis. This is by no means a definite rule however. Stamens 4–5, often 4 with two connate and two almost free. Bracteoles often long.

WEST AFRICA.

(i) Typical *paullinioides*. Leaf-rachis not or very narrowly winged. Leaflets thin and not at all coriaceous (thinner than most E. African forms) usually quite glabrous, entire or somewhat toothed, small (7–15 cm. long) and usually very dark green or brownish in dry state. Leaves ± 9-jugate. Inflorescence 12–25 cm. long. Flowers small, about 1 cm. long. Pedicels about 0·5 cm. long and bracteoles 2 mm. long. Calyx usually not very hairy, hairs adpressed. Sepals short and rounded. Stamens usually 4, but not infrequently 4–5. Sierra Leone, Liberia and Nigeria. *B. subulata* Hutch. & Dalz. and *B. lobulata* Sprague & Hutch. belong here, as well as *B. paullinioides*

(ii) Forms similar to the above but possessing a markedly winged leaf-rachis are much rare but occur in the Ivory Coast and Gold Coast. Intermediates between (i) and (ii) abound, and other forms with larger leaves occur. *B. leiostegia* Stapf and *B. pachythyrsa* Brehm. are intermediates. In some instances single large leaves have been made the type of new species, but they are of course not comparable with the leaves accompanying the inflorescences.

(iii) *Lely* P156 from Bauchi, N. Nigeria shows very close affinities with variety C. from Uganda. It is practically identical with *Thomas* 1979 from W. Nile district of Uganda. Leaf-rachis winged. Leaflets coriaceous, prominently veined, pale green below and pale lead-coloured above with a few hairs on the midrib only. Inflorescence 30–40 cm. long. Calyx and pedicels covered with brownish-golden hairs.

CONGO & CAMEROONS.

(i) Forms close to (ii) from West Africa occur, but they mostly have more coriaceous-glabrous leaflets approaching those of form (iii) from West Africa. Upper internodes of leaf-rachis sometimes moderately winged (" subalate " forms) or whole rachis not winged. Pedicels up to 1 cm. long. Bracteoles up to 5 mm. long. Calyx and pedicels are densely covered with buff or golden pubescence. Anterior sepals may be joined for only half their length. *B. tessmannii* Brehm. and *B. pallidinervia* Brehm. belong here. The number of stamens is predominantly 4 but 5 do occur.

(ii) *Lebrun* 7099 is a subalate form with the undersides of the leaves covered with a dense recumbent grey-buff indumentum.

(iii) Forms with affinities to var. B occur in the Katanga province of the Belgian Congo (e.g. *Ringoet* 113). Leaf-rachis broadly alate. Leaflets sparsely hairy beneath. Calyx, pedicels, peduncles and branches covered with gold hairs. Sepals rather narrow and acute, unlike the forms so far mentioned.

(iv) Variety E. Form with large leaves and flowers. Upper internodes of rachis broadly winged. Leaflets (of detached leaves) up to 20 cm. long, pubescent below when young (only the detached leaves not subtending an inflorescence have such big leaflets, but material is incomplete). Peduncles, rachis and inflorescence covered with golden pubescence. Pedicels up to 1·5 cm. long. Bracteoles ± 6 mm. Stamens 4.

(v) *Le Testu* 2055 from the Gaboon is similar to variety E, but lower pedicels up to 2·5 cm. long. Leaves with lower surfaces covered with a more dense golden indumentum.

ABYSSINIA.

(i) Forms with leaf-rachis not winged. Leaves 4–5-jugate. Leaflets small, glabrous, entire or serrate. Flowers ± sessile. Bracteoles small. Stamens 5. Seems very close to true *abyssinica* despite the two-lobed disc. *B. oligoneura* Brehm. belongs here. It was described from fruiting material but it appears to have a two-lobed disc.

(ii) Forms close to (i) but with such variations as leaves 7 9-jugate, leaf-rachis alate, pedicels up to 1 cm. long. Calyx densely brown-fulvous-tomentose. Mostly referable to var. C.

UGANDA.

Forms of ssp. *paulliniоides* are very common in Uganda. These are often only to be distinguished from true *abyssinica* by the two-lobed disc. Other characters such as winging of leaf-rachis and bracteole length are not constant. The fruit is usually large, 2-3 cm. or more long and not grooved.

(i) Variety C. This is extremely variable and the two extreme limits correspond to *B. engleriana* Gurke and *B. leucotricha* Brehm. Every possible intermediate may be found.

(a) Leaf-rachis usually winged, but sometimes very narrowly so or quite unwinged, with golden-brown pubescence. Leaflets small, about 7 × 2 cm., conspicuously dentate, undersides moderately velvety hairy, but occasionally glabrous, often pale grey or coppery above, and pale greenish-brown below in the dry state, with ± 10 main veins on each side. Internodes of leaf-rachis 1·5-2 cm. long. Inflorescence with golden-brown pubescence or glabrous, up to 30 cm. long. Flowers small, under 1 cm. long, pedicels ± 5 mm. long. Bracteoles 6–7 mm. long. Calyx with golden-brown pubescence. Stamens 4-5. (= *B. leucotricha* Brehm.) *Evans* 739, *Scott Elliot* 7027, *Kennedy* 1264.

(b) Similar to (a) but leaflets larger, up to 9-10 × 2·5 3 cm., more often entire but sometimes dentate, more often glabrous but sometimes hairy. Internodes of leaf-rachis 3-4 cm. long. Stamens 4-5.

(=*B. engleriana* Gürke) *Eggeling* 3009, *Snowden* 154. *Eggeling* 2584 and 1804 (with entire leaflets). *Eggeling* 3566 and 1836 (with non-alate leaf-rachis).

Variety B is closely related to this and there are many intermediates.

(ii) Variety D
Form with moderately large leaflets up to 14 × 5 cm., entire or sharply serrate, velvety-pubescent beneath, about 15 lateral nerves. Flowers 1-1·5 cm., pedicels up to 1 cm., bracteoles about 7 mm. Leaf-rachis broadly to narrowly winged. Calyx and inflorescence with golden hairs. Stamens 4, two connate and two free. *Dawe* 382 and *Purseglove* 2527.

(iii) Form allied to (i) and (ii). Leaf-rachis winged, leaflets 14 × 4 cm. glabrous. Flowers 1 cm. long and pedicels up to 12 mm. *Sangster* 651.

KENYA.

(i) Variety C
The same form as Uganda (i). The type of *B. leucotricha* Brehm. comes from Kenya—*Powell* 107. *Jackson* 325 is another example.

TANGANYIKA.

(i) Variety C
The same form as Uganda (i) e.g. *Bruce* 66, *Davies* 307, *Jessel* 51.
A similar form with small leaflets (6 × 1·5 cm.) having many nerves (up to 15 on either side), but leaf rachis not winged. Sepals acute. There is not enough material to show how distinct it is. *Adamson* 67, "*Conservator of Forests* 749" ex Imperial Forestry Institute, Oxford. (No further data).

(ii) Variety A
Leaf-rachis winged. Leaflets of leaves subtending inflorescences 10 cm. × 4 cm., other leaves with leaflets up to 22 cm. × 8 cm. in cultivated specimens, glabrous, slightly dentate or quite entire. Flowers large, 1-1·5 cm. long, pedicels and bracteoles up to 1 cm. long. Calyx fairly densely covered with golden hairs. Sepals often quite acute. Stamens 4, two connate and two free.

(iii) Variety D
Similar to (ii) but leaflets densely velvety beneath, entire, veins ± 15 on either side. Flowers, pedicels and bracteoles similar to (ii). (=*B. myriantha* Gilg & Brehm. from Kyimbila).

(iv) Variety B
Gillman 1295 from Lindi District is very similar to this.

(v) *Greenway* 6791 from Mbulumbulu. Leaf-rachis not winged. Leaflets large, oblong-ovate, glabrous. Inflorescence very like the *holstii* form of *abyssinica* s. str. Flowers small. Bracteoles very short. Calyx brownish not very hairy. Possibly an *abyssinica* with unusual two-lobed disc.

SOUTH TROPICAL AFRICA.

(1) Variety B
Leaf-rachis winged, very often broadly so. Leaflets usually entire

but occasionally serrate, up to 10 × 4 cm., with a very variable amount of yellow hair beneath—densely hairy to almost glabrous. Inflorescence and branches with golden-brown hairs. Flowers often ± sessile but lower pedicels sometimes up to 8 mm. long. Bracteoles up to 5 mm. long. Calyx densely covered with yellow brown or golden hair. Stamens 4–5, e.g. *Brass* 16163, *Johnston* 97, *Purves* 197. (=*B. schreberifolia* Brehm.).

This variety is very similar to variety C but the leaves of B are hairier and often broader. *Lugard* 239 from Elgon is very similar to *Purves* 197.

B. zombensis Dunkley, Kew Bulletin, **1937,** 470, is very similar in many ways but it has not been sunk into the *abyssinica* complex since little information is available. The leaves of the type are exceedingly densely covered beneath with yellow hairs and most of the parts are more hairy. It is *said* to be a very large timber tree whereas var. B is a smallish tree. Certain sheets however which are referred to *B. zombensis* are indistinguishable from var. B. The disc shows that *B. zombensis* agrees with ssp. *paullinioides*. Nyasaland.

(ii) Cf. variety C.
Forms very close to some Uganda material, but with practically unwinged rachis. *Gossweiler* 8708. *B. andongensis* Hiern belongs here. Angola.

B. angolensis Welw. ex Hiern is similar but has a more markedly winged rachis and broader elliptic leaflets. Angola.

(iii) *Miller* D 172 from Northern Rhodesia is very similar to *Adamson* 67 (see Tanganyika, form ii).

(iv) *Gossweiler* 9959 and 9842 are closely allied to variety D. They are both forms with large leaflets having very hairy undersides.

(v) *Gossweiler* 8066 and *Welwitsch* 1699 are also forms with large oblong leaflets but only the veins are hairy below to any extent. They would appear to be close to var. E.

This formidable list of forms will serve to show how great is the range of variation ; yet in spite of the very distinct appearance of certain plants it is not possible to find a structural character which holds good.

Of the forms which have not been sunk into *B. abyssinica* Fres. agg. the writer has little to say.

Bersamaide acutidens Welw. ex Hiern Cat. Welw. Afr. Plants 173, **1,** (1869)=*B. gossweileri* Bak. f. in Journ. Bot. **45,** 17, (1907).

This resembles a very large form of *B. abyssinica* ssp. *paullinioides* and may be very closely related, since there are large forms of the latter e.g. "*B. leiostegia* Stapf". Welwitsch stated that the leaves of one plant could be both winged and unwinged and the leaflets serrate or entire. Further material is needed to decide its status. *Wild* 2220 from Southern Rhodesia (fruiting material from a sapling of a tree 80′ high) is certainly the same form. Rachis winged, in one leaf (very young) the final alation is toothed. Leaflets large, serrate, 16 × 6 cm. Fruit 3·5–4 cm. long when full mature, not grooved, pubescent.

B. lucens (Hochst.) Szyszyl. in Rozpr. i Spraw. Akad. Umiej. **18,** 50 (1888) is a very distinct species from South Africa with obovate, obtuse, cuneate leaflets which have distinctly different venation. Leaves 1–3-jugate only. Fruit rugose. Stigma not capitate. Disc two-lobed.

B. rosea Hoyle in Kew Bulletin **1931,** 96. Mr. J. P. M. Brenan who has seen this plant many times in the field says that it seems to be the one tropical species of the genus that is certain. The habit, (a small shrub), the bright red flowers, and the short slender inflorescence appear to distinguish it from other *Bersama* species. But although the latter have white flowers one sometimes finds in the notes " tinged with pink ". The disc in *B. rosea* is entire or 4-lobed and the rachides of the leaves are not winged. The species thus shows affinities with *B. abyssinica* Fres. ssp. *abyssinica* s. str. Stamens 4–5. R. M. Davies writes concerning his specimen D.935 from Mufindi, Tanganyika—" specimen only a few feet high—becomes a forest tree ". This needs investigating.

B. stayneri Phillips in Bothalia **1,** 37, 63 (1921) from Natal seems distinct, from the description. No material has been seen.

B. swinnyi Phillips in Bothalia **1,** 36 (1921) from Pondoland is very distinct and readily distinguished by its extraordinarily condensed inflorescence and elliptic leaves.

B. swynnertonii Bak. fil. in Journ. Bot. **45,** 14 (1907) from Rhodesia **is** distinct. It seems intermediate between *B. lucens* and the tropical aggregate in many ways. Rachis not winged. Leaves 1–3-jugate. Flowers small, pink, Stigma not capitate. Fruit slightly rugose. Inflorescence short. Not re-collected.

B. transvaalensis Turrill in Kew Bulletin **1931,** 299. This is similar to the next species but has larger leaflets, longer racemes and a more echinate fruit, which, however, looks suspiciously pathological and galled.

B. tysoniana Oliv. in Hook. Icon. Pl. **23,** t. 2267 (1893). Quite distinct on account of its tuberculate fruits.

" *Bersama* " *mossambicensis* Sim, For. Fl. Port. E. Africa, 34, (1909), is, as Sim himself suggests, not a *Bersama* at all. It has a quite different venation. Sim states that his plant had 14-15 stamens which would seem to rule out *Melianthaceae* altogether. There are fruiting specimens at Kew from localities as distant as Kenya Colony and Zululand (*H. H. Curson*). Until good flowering material correlated with fruiting material has been obtained, the true position of this species will have to remain uncertain.

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NOTES ON TROPICAL WEST AFRICAN SPECIES OF COMBRETUM : I

R. W. J. Keay

In the Flora of West Tropical Africa (1927) Hutchinson and Dalziel recognised 46 species of *Combretum*. Their key to the genus is admittedly artificial and is not related to the sections proposed by Engler and Diels (1899) in their monograph of the African species. Important characters in Hutchinson and Dalziel's key include leaf-shape, indumentum on leaves and flowers, and whether or not the inflorescence is branched. Unfortunately these characters are far from constant in several species and sometimes even on individual plants. Thus in this Flora several species are maintained which can no longer be regarded as distinct. Some of the species newly described in the Flora have proved to be synonymous with previously described species, others have been omitted, and altogether the need for revision is evident.

Roberty (Candollea **11,** 39 : 1947) has published a revision of the West African species based upon material in the Geneva herbarium. Roberty's concept of a species is, however, so unorthodox and his taxonomy so open to criticism that few botanists are likely to accept his conclusions. Some of Roberty's "species" correspond roughly with Engler and Diels' sections, but in other "species" he lumps together as "sub-species", "varieties" or "forms" several species which most botanists regard not only as distinct, but as belonging to different sections. The savanna trees of §*Glabripetalae* and §*Ciliatipetalae*, for instance, are lumped under *C. glutinosum* Perr. ex DC., while most of the smaller flowered forest climbers come under *C. mucronatum* Schumach & Thonn.

Roberty's treatment of two other species may be mentioned here as examples of his revision. *C. acutum* Laws. is reduced to *C. mucronatum* Schumach & Thonn. forma *acutum* (Laws.) Roberty with *C. afzelii* Engl. & Diels as a synonym ; the specimen *Lebrun* 883 which he cites is *C. cuspidatum* Planch. ex Benth., according to the duplicate in Kew. Now *C. smeathmannii* G. Don (=*C. mucronatum*) comes into §*Mucronatae*, *C. cuspidatum* Planch. ex Benth. (=*C. afzelii* Engl. & Diels) into §*Combretastrum*, and *C. acutum* Laws. which was unplaced by Engler & Diels is distinct enough to need a new section, §*Acutae* (vide infra).

Roberty evidently did not see the type of *C. bauchiense* Hutch. & Dalz., but because the authors described it as "affinis *C. herbaceo* G. Don, sed foliis infra glandulosis vel glabris, ovario et calyce leviter pubescente differt", Roberty decided that it is no more than a glabrous variety of *C. herbaceum* G. Don. Now an examination of the type of *C. bauchiense* shows that it should come into §*Glabripetalae* with strong affinities to savanna trees of the *C. ghasalense* Engl. & Diels alliance, whereas *C. sericeum* G. Don (=*C. herbaceum*) is allied to forest climbers of §*Conniventes* (including §*Parvulae*) ; thus *C. bauchiense* is not only specifically distinct from *C. sericeum*, but sectionally also.

The need for revision is therefore as great as ever. To attempt a revision of the West African species alone would be unsatisfactory, but the time is not yet ripe for a revision of the genus as a whole. In the meantime it seems best to work as far as possible within the framework of the sections proposed by Engler and Diels. Within some of these sections it has been possible to revise and to construct keys for the West African species, and the results are published in this paper. In other sections, however, much further work is needed and it seems wise to postpone publication.

The work upon which this paper is based has been carried out at intervals during the past five years in the field in Nigeria and in British herbaria. The co-ordination of field collecting with herbarium work has been particularly rewarding, especially in assessing the value of characters such as leaf-shape and degree of indumentum, and in matching flowering and fruting stages. I am indebted to the Directors of the Royal Botanic Gardens, Kew and of the Imperial Forestry Institute, Oxford, to the Keeper of Botany at the British Museum and to the Chief Conservator of Forests, Nigeria, for facilities afforded. I am also greatly indebted to Mr. A. W. Exell, who for many years has made a special study of the genus, for expert advice and assistance at various stages of my work.

The conspectus published below shows the sections and species at present known in the area of Hutchinson and Dalziel's Flora of West Tropical Africa. There appear to be at least 8 species of savanna trees in §*Glabripetalae*, but as several unsolved problems of taxonomy and nomenclature are involved these species are omitted from the present conspectus. A useful account of some of the *Glabripetalae* has recently been given by Aubréville (Les Combretum des Savanes Boisées de l' A.O.F., 1944). Also in Aubréville's paper are three new species (lacking Latin descriptions) —*C. etessei* Aubrév., *C. nioroensis* Aubrév., *C. maclaudii* Aubrév.—which I have been unable to place owing to lack of authentic material

CONSPECTUS OF *COMBRETUM* LOEFFL. IN THE AREA OF HUTCHINSON AND DALZIEL'S FLORA OF WEST TROPICAL AFRICA.

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§**Tomentosae** Engl. et Diels
C. tomentosum G. Don

§**Paucinerves** Engl. et Diels
C. micranthum G. Don
C. homalioides Hutch. et Dalz.
C. demeusei De Wild.
C. obanense (Bak. f.) Hutch. et Dalz.

§**Combretastrum** Eichl. [incl. §*Olivaceae* Engl. et Diels]
C. cuspidatum Planch. ex Benth.
C. insulare Engl. et Diels

§**Mucronatae** Engl. et Diels
C. smeathmannii G. Don

§**Ciliatipetalae** Engl. et Diels
C. nigricans Lepr. ex Guill. et Perr., and var. *elliotii* (Engl. et Diels) Aubrév.
C. velutinum DC., and " variété glabre " of Aubréville

§**Glabripetalae** Engl. et Diels

Several savanna trees ; the suffrutices *C. bauchiense* Hutch. et Dalz. and *C. relictum* Hutch. et Dalz. ; and the scandent shrub *C. oyemense* Exell

§**Capituliformes** Engl. et Diels

C. zenkeri Engl. et Diels

§**Conniventes** Engl. et Diels [incl. §*Parvulae* Engl. et Diels]

C. paniculatum Vent. (aggr.)
C. confertum Laws.
C. calobotrys Engl. et Diels
C. lecardii Engl. et Diels
C. mannii Engl. et Diels
C. tarquense J. J. Clark
C. sericeum G. Don

§**Acutae** Keay, sect. nov. (vide infra)

C. acutum Laws.

§**Fuscae** Engl. et Diels

C. fuscum Planch. ex Benth.
C. bipindense Engl. et Diels
C. sordidum Exell
C. batesii Exell
C. fulvum Keay, sp. nov. (vide infra)

§**Racemosae** Engl. et Diels

C. racemosum P. Beauv., et var. *flammeum* Welw. ex Laws.
C. cinereipetalum Engl. et Diels

§**Grandiflorae** Engl. et Diels

C. grandiflorum G. Don
C. comosum G. Don
C. hispidum Laws.
C. dolichopetalum Engl. et Diels
C. rhodanthum Engl. et Diels (?)

§**Trichopetalae** Engl. et Diels

C. aculeatum Vent.
C. constrictum Laws.

§**Cacoucia** (Aubl.) Engl. et Diels

C. platypterum (Welw.) Hutch. et Dalz.
C. bracteatum Engl. et Diels
C. mooreanum Exell

§*Campylogyne* Engl. et Diels is excluded, having been transferred by Exell (Journ. Bot. **68,** 1930) to the genus *Quisqualis* Linn. The systematic position of the suffrutescent species is discussed elsewhere and §*Parvulae* Engl. et Diels is included in §*Conniventes* Engl. et Diels. Owing to lack of material Engler and Diels were unable to place *C. acutum* Laws., but an examination of the adequate material now available at Kew shows that a new section is required ; it is described as follows :—

§**Acutae** Keay. Sectio nova, a §*Lasiopetalis* Engl. et Diels qua affinis, staminibus inclusis quam receptaculum superius brevioribus, stylo haud exserto, petalis orbicularibus distincta. Typus : *Combretum acutum* Laws.

Flores 5-meri, sessiles. *Receptaculum* inferius fusiforme, superius campanulatum ; discus inconspicuus adanatus. *Petala* epilosa, orbicularia, breviter unguiculata. *Stamina* 10, inclusa, quam receptaculum superius breviora, filamentis brevissimis. *Stylus* receptaculo superiori aequilongus, non exsertus.

In the citations which follow the specimens are in the Herbarium of the Royal Botanic Gardens, Kew, unless otherwise stated. Abbreviations for other herbaria are :—

Hb. Brit. Mus.—Herbarium of the British Museum (Nat. Hist.)
Hb. Imp. For. Inst. Oxon.—Herbarium of the Imperial Forestry Institute, Oxford.
Hb. Fielding—Fielding's Herbarium in the School of Botany, Oxford University.
For. Hb. Ib.—Forest Herbarium, Ibadan, Nigeria.

Sect. TOMENTOSAE Engl. et Diels

C. tomentosum *G. Don* in Edin. Phil. Journ. **11,** 346 (1824) ; Lawson in Oliv. Flor. Trop. Afr. **2,** 430 (1871), pro parte, excl. spec. *Kirk.* ex Batoka et Tette ; Engl. et Diels, Monogr. Afr. Pflz. **3,** 16 (1899), excl. spec. *Kirk* ; Hutchinson et Dalziel, Flor. W. Trop. Afr. **1,** 218, 221 (1927) ; Roberty in Candollea **11,** 81 (1947).
C. chrysophyllum Guill. et Perr., Flor. Senegamb., 289 (1833).

SENEGAL. *Heudolot* 375 (1839).

FRENCH GUINEA. Farana, alt. c. 1070 m., lat. 10° N., plateau east of Niger, *Scott Elliot* 5364 (frts. Mar. 1892) ; Kouroussa, *Pobeguin* 642 (fls. Feb. 1901) ; Timbo Kouria, *Chevalier* 14778 (fls. Dec. 1905) [Hb. Brit. Mus.] ; between Mamon and Dalaba, *Dalziel* 8407 (fls. Mar. 1927).

FRENCH SUDAN. Sicoro near Bammako, *Chevalier* 212 (fls. Jan. 1899).

SIERRA LEONE. *Afzelius* s.n. [Hb. Brit. Mus.] ; Scarcies near Kukuna, *Scott Elliot* 4666 (fls. Jan. 1892).

In the Flora of Tropical Africa Lawson cited as this species specimens collected by Kirk in the highlands of Bakota country and at Tette on the Zambesi. These specimens are at Kew, and although rather poor certainly belong to §*Breviramae* and are not *C. tomentosum* G. Don. It appears therefore that *C. tomentosum* is confined to the western part of tropical West Africa.

This is the only West African species of §*Tomentosae.* The leading characters of this section are the very shallow upper receptacle which leaves the disc fully exposed even in pressed specimens and the stamens which are shorter than the petals. *C. tomentosum* is a scandent shrub clothed with dense brownish tomentum on the inflorescences young branches and on the lower surface of the leaves.

Sect. PAUCINERVES Engl. et Diels

This section includes three rare species of the rain forest, as well as *C. micranthum* G. Don, a common plant of the drier savanna regions. The species of this section have a shallow upper receptacle which does not conceal the disc even in pressed specimens ; the stamens are longer than the petals ; scales are usually present.

A. Flower spikes lax in ample panicles ; mature leaves usually over 6 cm. long ; rain forest species.

  a. Flower spikes up to 5 cm. long ; leaves cuneate at the base, glabrous but glandular below, with pits in the axils of the main nerves ; inflorescence-axes pubescent, lower receptacle with abundant whitish scales, upper receptacle glabrous or sparsely pubescent outside . . . . *C. obanense*

  b. Flower spikes usually at least 5 cm. long ; leaves cordate or rounded at the base.

    i. Leaves glabrous shining, pits in the axils of the main nerves, ultimate veins raised beneath ; inflorescence-axes shortly pubescent and with sparse red scales, lower receptacle glabrous viscid, upper receptacle glabrous outside . . . . *C. homalioides*

    ii. Leaves pubescent on the mid rib below and petiole, without pits, ultimate veins not raised beneath ; inflorescence-axes and upper and lower receptacle pubescent and with abundant red scales . . *C. demeusei*

B. Flower spikes dense, up to 3 cm. long, usually solitary in the leaf axil ; mature leaves usually less than 6 cm. long (rarely up to 9 cm.) cuneate at the base ; inflorescence-axes and upper and lower receptacle with abundant red scales ; savanna species *C. micranthum*

C. obanense (*Bak. f.*) *Hutch. et Dalz.*, Flor. W. Trop. Afr. **1,** 219, 221 (1927) et in Kew Bull. **1928,** 228 (1928) ; Exell in Journ. Bot. **67,** 101 (1929).

C. paucinervium Engl. et Diels var. *obanense* Bak. f. in Cat. Talbot's Nigerian Pl., 38 (1913).

C. micranthum G. Don var. *obanense* (Bak. f.) Roberty forma *obanense* (Bak. f.) Roberty in Candollea **11,** 84 (1947), quoad syn. *C. obanense* (Bak. f.) Hutch. et Dalz.

The type-gathering is still the only record from the area of the Flora of West Tropical Africa. The species is also known in the Gaboon (e.g. *Le Testu* 9353, in Hb. Brit. Mus. et Hb. Kew).

C. homalioides *Hutch. et Dalz.*, Flor. W. Trop. Afr. **1,** 219, 221 (1927) et in Kew Bull. **1928,** 225 (1928) ; Exell in Journ. Bot. **66,** Suppl. Polypet., 165 (1928).

C. micranthum G. Don var. *obanense* (Bak. f.) Roberty forma *homalioides* (Hutch. et Dalz.) Roberty in Candollea **11,** 84 (1947), quoad syn. *C homalioides* Hutch. et Dalz.

NIGERIA. Onitsha, *Barter* 1803 (typus in Hb. Kew) ; Onitsha Province ; Udi Forest Reserve, *J. Smith* 33 (fls. Nov. 1928) (Hb. Brit. Mus. ; For Hb. Ib.)

Barter described the type-gathering as " Tree, 60 feet. Flowers white, scenting the whole forest ". The specimen has however every appearance of being a liane like other members of §*Paucinerves*, and the existence of a *Combretum* as a forest tree 60 feet high seems most unlikely. It is reasonable to suppose that Barter saw the plant climbing high up on a tree and mistook it for the tree itself. Unfortunately Smith's specimen lacks notes about habit.

Exell (l.c.) has identified *Gossweiler* 8787 from the Portuguese Congo with this species, but " with some reserve, as there is only this one specimen from the Portuguese Congo to compare with the single specimen known from the type locality ". The Congo specimen has somewhat smaller and more rounded leaves but otherwise agrees very well with the type. In view of the variation in size of leaf which is known to occur in single plants of this genus, it seems likely that the Congo specimen is in fact *C. homalioides.*

C. demeusei *De Wild.* in Ann. Mus. Congo, sér. 5, **3,** 235 (1910) ; Exell in Journ. Bot. **67,** 103 (1929).

C. mildbraedii Hutch. et Dalz. in Flor. W. Trop. Afr. **1,** 218, 221 (1927) et in Kew Bull. 1928, 225 (1928).

C. micranthum G. Don var. *typicum* Roberty forma *mildbraedii* (Hutch. et Dalz.) Roberty in Candollea **11,** 83 (1947), quoad syn. *C. mildbraedii* Hutch. et Dalz.

FRENCH GUINEA. Timbo, Kouria et environs, *Chevalier* 14792 (fls. Nov. 1905) ; without locality, *Chevalier* 15113.

GOLD COAST. Western Province, Essiama, *Irvine* 2317 (frts. Feb. 1934) ; Hohoe District, near Alavanyo, *St. Clair Thompson, Gold Coast F.D. Herb. No.* 3660 (fls. Nov. 1934) [Hb. Imp. For. Inst. Oxon.].

TOGOLAND. Misahohe, *Mildbraed* 7305 (fls. Nov. 1913) [typus *C. mildbraedii* Hutch. et Dalz. in Hb. Kew.].

NIGERIA. Onitsha Province, Enugu Forest Reserve, *J. Smith* 23 (fls. Oct. 1928) [Hb. Brit. Mus. ; For. Hb. Ib.].

The type-specimens of *C. demeusei* were collected in the Belgian Congo and when Exell (l.c.) identified *C. mildbraedii* with it the species appeared to have a markedly discontinuous distribution. Specimens have however since been collected in the Gold Coast, Nigeria and Gaboon and it is evident that this is a widespread but rare species. *Smith* 23 is described as a " shrub of fringing forest ".

Irvine 2317 is the only specimen in Kew with fruits ; these are broadly elliptic, emarginate at the apex and from 1·6 to 2 cm. long. They differ somewhat from the acutely ovate fruits shown in De Wildeman's original plate (t. 49, l.c.) but these are possibly immature.

C. micranthum *G. Don.* in Edin. Phil. Journ. **11,** 347 (1824) ; Guillemin et Perrottet, Flor. Senegamb., 287 (1833) ; Engler et Diels, Monogr. Afr. Pflz. **3,** 17 (1899) ; Hutch. et Dalz., Flor. W. Trop. Afr. **1,** 217, (1927) ; Aubréville, Combret. des Sav. Bois. A.O.F., 27–30 (1944).

C. parviflorum Rchb. Ic. Bot. Exot. 46, t. 62 (1827).

C. altum Perr. in DC. Prodr. **3,** 20 (1828), et in DC. Mém. Comb., 34 (1828) ; Guillemin et Perrottet, Flor. Senegamb., 287 (1833) ; Lawson in Oliv. Flor. Trop. Afr. **2,** 428 (1871) ; Engl. et Diels, l.c., 18 (1899).

Bureava crotonoides Baill. in Adansonia **1,** 72 (1860) [fide Engler et Diels].

C. raimbaultii Heckel in Rep. Pharm., 627 (1891) [fide Engler et Diels].

[*C. micranthum* G. Don var. *typicum* Roberty forma *paucinervium* [non (Engl. et Diels) Roberty] Roberty in Candollea **11,** 82 (1947), quoad syn. *C. micranthum* G. Don sensu stricto, non quoad syn. *C. paucinervium* Engl. et Diels, l.c. 17 (1899).]

C. micranthum G. Don var. *typicum* Roberty forma *altum* (Perr.) Roberty, l.c. 83 (1947), quoad syn. *C. altum* Perr.

SENEGAL. *Sieber* 25 *Heudelot* 284 (1839).

GAMBIA. *M. T. Dawe* 83.

PORTUGUESE GUINEA. Pussube, *Joaquim Viegas* 1185 (fls. Jun. 1938).

FRENCH GUINEA. *Heudelot* 812 ; *Leo Farmar* 191.

FRENCH SUDAN. Gourma, de Fada à Koupela, *Chevalier* 24517 (fls. and young frts. July 1910).

SIERRA LEONE. Scarcies River, on the way to Kukuna, *Scott Elliot* 4702a (frts. Jan. 1892) ; *Scott Elliot* 4753.

GOLD COAST. *T. Lloyd Williams* 521.

FRENCH NIGER. Niamey-Zinder, *Hagerup* 568a (frts. Oct. 1927).

NIGERIA. Nupe, *Barter* 1645 & 1711 ; Sokoto, *Dalziel* 429 (fls. Jul. 1910).

[N.B. The above citation has been limited to one or two specimens per country only].

This species is widespread and frequent in the Sudan and Sahel zones of West Africa, but appears to reach the limit of its range somewhere in north-eastern Nigeria.

Usually *C. micranthum* is found as a low shrub but it is recorded as a small tree in Senegal and I have also seen it as a liane in Nigeria. Arborescent specimens have been named *C. altum* Perr. and Roberty (l.c.) uses the name *floribundum* as a *forma* for what is evidently the sarmentose state. It appears however that the habit of this species depends largely on external influences. The impression gained during an ecological survey of a part of Sokoto Province (see Keay in Journ. Ecol. **37,** 335-364 : 1950) was that the natural state of this species is as a liane but that repeated burning and cutting produce the low shrubby state in which it is usually seen.

[**C. paucinervium** Engl. et Diels, Monogr. Afr. Pflz. **3,** 17 (1899).

Engler and Diels stated that the type (*Mann* 1817) was probably collected in the Cameroons. On the iso-type at Kew, however, the locality is noted as " River Kongui, Lat. 1°N ". This is in Spanish Guinea and outside the area of the Flora of West Tropical Africa.]

Doubtful and excluded species of Sect. PAUCINERVES.

C. floribundum Engl. et Diels, l.c., 18 (1899).

This is included by Hutchinson and Dalziel as a synonym of *C. micranthum* G. Don, but I have not seen the type specimens (*Lecard* 63 and 72).

C. nigricans Lepr. ex Guill. et Perr., Flor. Senegamb. 290 (1833).

As Exell has pointed out (Journ. Bot. **67,** 141, 1929) this species should be transferred to §*Ciliatipetalae.*

Sect. COMBRETASTRUM Eichl.

(Sect. *Olivaceae* Engl. et Diels)

This section includes two forest climbers in West Tropical Africa. One of them, *C. cuspidatum,* is widespread from Sierra Leone to the Belgian Congo, while the other, *C. insulare,* in so far known only from single localities in Fernando Po, the Cameroons and Nigeria. Species of this section have small tetramerous flowers with a campanulate upper receptacle ; the disc is poorly developed and has no free edge.

A. Fruit orbicular, emarginate at the apex, yellow-brown, with wide papery wings ; leaves chartaceous, drying pale brown or dull green ; main lateral nerves markedly looped near the margin, tertiary nerves almost at right angles to the main laterals ; upper receptacle drying pale pinkish-brown . . . . . *C. insulare*

B. Fruit ovate with long beak, dark brown, with thick narrow wings ; leaves coriaceous, drying dark brown, grey or black ; main lateral nerves not markedly looped, tertiary nerves at an acute angle to the main laterals ; upper receptacle drying dark brown or black . . *C. cuspidatum*

C. insulare *Engl. et Diels,* Monogr. Afr. Pflz. **3,** 21 (1899) ; Hutchinson et Dalziel, Flor, W. Trop. Afr. **1,** 219, 221 (1927).

[*C. cuspidatum* (non Planch. ex Benth.) Laws. in Oliv. Flor. Trop. Afr. **2,** 426 (1871), pro parte, quoad spec. *Mann* ex Fernando Po.]

[*C. mucronatum* Schumach. et Thonn. forma *cuspidatum* (Planch. ex Benth.) Roberty in Candollea **11,** 84 (1947), pro parte, quoad syn. *C. insulare* Engl. et Diels]

NIGERIA. Oyo Province, Ibadan North Forest Reserve, *Chizea* in For. Hb. Ib. No. 23971 (frts. Febr. 1950).

BRIT. CAMEROONS. Victoria, sea level, *Maitland* 380 (frts. Feb. 1929) ; same locality, *Maitland* 773 (fls. Nov. 1929) ; Victoria, alt. 100 feet, *Maitland* 1061 (frts. Mar. 1930). [all three specimens are also in For. Hb. Ib.]

FERNANDO PO. *Mann* 1156 (fls. 1861) [Iso-typus in Hb. Kew.].

This species was described in absence of fruits and was distinguished from *C. cuspidatum* Planch. ex Benth. on account of the nervation of the leaves. The identification of Maitland's specimens with Mann's type shows that the fruits are quite different from those of *C. cuspidatum.* The fruit, hitherto unknown, may be described as follows :—

> Fructus quadrialatus, sub-orbicularis vel oblongus, circiter 3·8 cm. longus, 2–3·5 cm. latus, pallide brunneus, nitens, glaber, basi sinu late triangulari, apice emarginatus, alis quam corpus duplo latioribus, chartaceis.

C. cuspidatum *Planch. ex Benth. in Hook.,* Flor. Nigritiana, 340 (1849) ; Lawson in Oliv. Flor. Trop. Afr. **2,** 426 (1871), pro parte, excl. spec.

Barter 1803 ; Engler et Diels, Monogr. Afr. Pfl . **3,** 21 (1899), pro parte, excl. spec. *Barter* 1803 ; Hutch. et Dalz., Flor. W. Trop. Afr. **1,** 219, 221 (1927).

[*C. afzelii* (non G. Don) Engl. et Diels l.c. 22 (1899), Hutch. et Dalz. l.c., 219, 221 (1927).]

C. conchipetalum Engl. et Diels, l.c. 22 (1899), Le Testu et Exell in Bull. Soc. Linn. Normandie, sér. 8, **9,** 127 (1936).

C. calvescens Exell in Journ. Bot. **67,** 103 (1929).

C. mucronatum Schumach. et Thonn. formae *cuspidatum* (Planch. ex Benth.) Roberty, et *conchipetalum* (Engl. et Diels) Roberty in Candollea **11,** 85 (1947).

C. mucronatum Schumach. et Thonn. forma *acutum* (Laws.) Roberty l.c., 85 (1947), quoad syn. *C. afzelii* Engl. et Diels, quoad spec. *Lebrun* 883, non quoad syn. *C. acutum* Laws.]

SIERRA LEONE. *Afzelius* s.n. [iso-typus *C. afzelii* Engl. et Diels in Hb. Brit. Mus.] ; *Vogel* 47 (fls. Jun. 1841) [typus in Hb. Kew.] ; Senge, between Gbangbama and Gbangbatok, *Deighton* 2369 (fls. Nov. 1931) ; Njala, *Deighton* 3096 (fls. Nov. 1935), 3445 (same plant as 3096, fls. Nov. 1937), 3539 (same plant as 3096 and 3445, frts. Apr. 1938) ;

GOLD COAST. River Tano, *Chipp* 343 (fls. Sept. 1912).

NIGERIA. Lagos, Iddo Island, *Millen* 7 (fls. Oct. 1891) [co-typus *C. afzelii* Engl. et Diels in Hb. Kew.].

FERNANDO PO. *Mann* 410 (fls. Jun. 1860).

Also recorded from the French Cameroons (*Buchholz* s.n., iso-type of *C. conchipetalum* Engl. et Diels in Kew Herb. ; *Zenker* 2686) and from the Belgian Congo (*Vermoesen* 1328 ; *Lebrun* 883 ; *Vanderyst* 4148 type of *C. calvescens* Exell in Brit. Mus. Herb.)

The excellent specimens collected in Sierra Leone from a single plant by Mr. F. C. Deighton show a range of variation which covers four species which have been regarded as distinct. The inflorescence (especially in young spikes) in some of Deighton's specimens is clothed with a rusty pubescence approximating very closely to that of *Vogel* 47 (type of *C. cuspidatum* Planch. ex Benth.) and *Vanderyst* 4148 (type of *C. calvescens* Exell) ; in others the indumentum is relatively sparse and the specimens are not to be distinguished from the type of *C. afzelii* Engl. & Diels and *C. conchipetalum* Engl. & Diels, two species which have already been united by Exell (l.c.). The shape of the leaves varies considerably even on a single plant. In well developed leaves there is a distinct cusp but in many the apex is malformed and may be rounded or emarginate. The texture and appearance of the leaves, as described in the above key, are very characteristic and constant.

Roberty (l.c.) regards this species in its various states as *formae* of *C. smeathmannii* G. Don (=C. mucronatum *Schumach. et Thonn.*), but this is entirely unjustified. Quite apart from the flowers and leaves, there is a remarkable difference in fruits ; in *C. smeathmannii* the fruit is about

1·3 cm. long, more or less orbicular, with delicate pale fawn papery wings, whereas in *C. cuspidatum* the fruit is about 4·5 cm. long, ovate with a long beak, dark brown tough, and with thick narrow wings.

Sect. FUSCAE Engl. et Diels

This section will be dealt with in a later contribution, only the new species already mentioned in the conspectus being described now :—

Combretum fulvum *Keay*, sp. nov. ; a *C. batesii* Exell ramulis et omnibus partibus inflorescentiae ferrugineo-lepidotis, staminibus biserialibus, stylo apicem versus haud incrassato, foliis oblongis vel oblongo-obovatis subtus impresso-lepidotis, distincta.

Frutex scandens. *Ramuli* juveniles ferrugineo-lepidoti. *Folia* opposita, petiolata, petiolo sparse puberulo et ferrugineo-lepidoto 5–8 mm. longo ; lamina oblonga vel oblongo-obovata, basi rotundata vel anguste cordata, apice acuminata vel aliquando rotundato-apiculata, 8–17 cm. longa, 3·5–7·5 cm. lata, plus minusve coriacea, supra nitidula glabra, subtus minutissime impresso-lepidota, margine integra leviter undulata ; costa supra impressa, subtus prominens ; nervi laterales 7–14 utrinque prominuli, sub marginem arcuatim anastomosantes ; rete venularum utrinque satis obvium. *Flores* tetrameri in spicas glomeruliformes paniculatas dispositi ; spicae 1–2·5 cm. longae, pedunculis 1–1·5 cm. longis ferrugineo-ledidotis. *Receptaculum inferius* 2–2·5 mm. longum, dense ferrugineo-ledidotum ; *superius* elongato-infundibuliforme, 3·5 mm. longum, 2 mm. latum, extus ferrugineo-lepidotum, intus sparse puberulum ; discus inconspicus, omnino adnatus ; segmenta calycis late triangularia, usque 0·6 mm. longa, more receptaculi superioris vestita. *Petala* alba, demum flavescentia, glabra, oblanceolata, circiter 2 mm. longa, 0·7 mm. lata. *Stamina* biserialia, exserta, filamentis circiter 5 mm. longis ; antherae late ellipticae, circiter 0·6 mm. longae. *Stylus* glaber, exsertus, circiter 5 mm. longus, apicem versus haud incrassatus. *Fructus* quadrialatus, orbicularis, 3–4 cm. diametro, basi cordatus, apice emarginatus, alis quam corpus duplo latioribus chartaceis pallide brunneis sparse ferrugineo-lepidotis, corpore dense ferrugineo-lepidoto.

SIERRA LEONE. Njala, 10 Oct. 1928, *Deighton* 1332 (Hb. Kew., typus ; Hb. Brit. Mus.) :—straggling bush ; white flowers, turning yellow. Mano, Taiya River, 22 Jan. 1927, *Dalziel* 8097 (Hb. Kew., type of fruits) :—woody climber on bank of river.

This species seems best placed in §*Fuscae* Engl. & Diels despite the fact that the style is not thickened at the apex. Exell (Journ. Bot. **67,** 145, 1928), in describing *C. sordidum* and *C. batesii*, has already pointed out that the thickening of the style is of doubtful value as a sectional character. If the style character is regarded as important than *C. fulvum* would come into §*Chionanthoideae* Engl. & Diels, and in some respects it does resemble species of this section, especially *C. butyrosum* (Bertol. f.) Tul. The fruit of the new species is however of the normal winged type which appears to be general in §*Fuscae* ; most species of §*Chionanthoideae* having bulky fruits, ridged but scarcely winged.

I must thank Mr. A. W. Exell, who had provisionally annotated Deighton's specimen at Kew as a new species, for generously placing it at my disposal.

THE SYSTEMATIC POSITION OF SUFFRUTESCENT SPECIES OF COMBRETUM LOEFFL.

R. W. J. Keay

In their monograph on the African species of *Combretum*, Engler and Diels recognised six suffrutescent species. One of these, *C. argyrotrichum* Welw. ex. Laws., was placed in §*Ciliatipetalae*, but the others were brought together naturally into §*Parvulae*, a section differing from the forest shrubs and lianes of §*Connmventes* mainly in the suffrutescent habit. The five species of §*Parvulae* as first understood by Engler and Diels were .— *C. sericeum* G. Don (=*C. herbaceum* G. Don, first reduced to synonymy by Bentham in Hooker's Flora Nigritiana, 341: 1849), *C. parvulum* Engl. et Diels, *C. platypetalum* Welw. ex Laws., *C. oatesii* Rolfe and *C. turbinatum* F. Hoffm. Engler and Diels also mentioned the Asiatic suffrutex *C. nanum* Ham. and placed it in their §*Ovalifoliae* because of its obvious affinities with the scandent shrubs and lianes of this section. It will be seen therefore that Engler and Diels recognised suffrutescent species in three distinct sections of the genus. There has however been a tendency among subsequent botanists to compare all suffrutescent species with §*Parvulae*, irrespective of floral structure.

C. viscosum Exell was placed by its author in §*Parvulae*, but its closest affinity, as Mr. Exell himself lately suggested, appears to be the tree *C. apiculatum* Sond. of §*Ciliatipetalae*.

C. harmsianum Diels was described without flowers and was placed by its author in §*Parvulae*, but Exell (1936) in identifying flowering specimens rightly transferred it to §*Glabripetalae* on account of floral structure.

C. bauchiense Hutch. et Dalz. was compared by its authors with *C. sericeum* G. Don (=*C. herbaceum*) which it resembles in habit. The two species are however widely separated as regards floral structure, *C. bauchiense* coming naturally into §*Glabripetalae*. Within the *Glabripetalae* the closest affinity of this species appears to be, moreover, not with the suffrutescent *C. harmsianum*, but with trees of the *C. ghasalense* Engl. et Diels alliance.

C. relictum Hutch. et Dalz. was not originally recognised as a suffrutex. Aubréville (1944) has, however, shown that the type-specimen (*Heudelot* 747), as indicated by the collector's notes, as well as subsequently by specimens from the same region, is in fact suffrutescent. The closest affinity of this species appears to be with the tree *C. glutinosum* Perr. ex DC. in §*Glabripetalae*. Aubréville considers it to be a variety of *C. glutinosum*.

It appears therefore that the suffrutescent habit has arisen in at least three sections of the genus in addition to §*Parvulae*, and the natural relationships of these suffrutices are most clearly seen by placing them in sections according to their floral structure rather than in a single section on account of life form. The suffrutescent habit alone cannot, it seems, be regarded as a character of sectional importance, and the validity of Engler and Diels' §*Parvulae* must be called in question. The differences in floral structure between sufrutices of the *C. sericeum* and *C. platypetalum* alliances and the lianes and shrubs of §*Conniventes* are very minor and, in my opinion, not of sectional importance. A further reason for including these suffrutices in §*Conniventes* is that plants of the *C. sericeum* complex have recently been found in Nigeria intermediate in life-form between suffrutices and scandent shrubs.

The suffrutescent species of *Combretum* should therefore be placed in sections as follows :—

§**Ciliatipetalae** Engl. et Diels

Predominantly a section of savanna trees in tropical Africa.

Suffrutices :— *C. argyrotrichum* Welw. ex Laws. in Oliv. Flor. Trop. Afr. **2,** 432 (1871)

C. viscosum Exell in Journ. Bot. **66,** Suppl. 1, 171 (1928)

§**Glabripetalae** Engl. et Diels

Predominantly a section of savanna trees in tropical Africa.

Suffrutices :— *C. harmsianum* Diels in Engl. Bot. Jahrb. **39,** 505 (1907)

C. bauchiense Hutch. et Dalz. in Flor. W. Trop. Afr. **1,** 216, 220 (1927), et in Kew Bull. **1928,** 224 (1928)

C. relictum Hutch. et Dalz. in Flor. W. Trop. Afr. **1,** 218, 221 (1927), et in Kew Bull. **1928,** 225 (1928)
C. glutinosum Perr. ex DC. var. *relictum* (Hutch. te Dalz.) Aubréville in Combret. des Savanes Boisées de l'A.O.F., 23 (1944)

§**Ovalifoliae** Engl. et Diels

Predominantly a section of scandent shrubs and lianes in tropical Asia.

Suffrutex :— *C. nanum* Ham. ex D. Don, Prodr. Fl. Nep. 219 (1825)

§**Conniventes** Engl. et Diels (incl. §*Parvulae* Engl. et Diels)

Predominantly a section of scandent shrubs and lianes in tropical Africa.

Suffrutices :— *C. sericeum* G. Don in Edin. Phil. Journ. **9,** 347 (1824)

C. platypetalum Welw. ex Laws. in Oliv. Flor. Trop. Afr. **2,** 433 (1871)

Closely allied to the above and possibly conspecific with one or other of them are the following :—

C. oatesii Rolfe in Oates, Matabele Land, ed. **2,** 399 (1899)

C. turbinatum F. Hoffm. Beitr. Fl. Centr. Ost. Afr., 28 (1899)

C. parvulum Engl. et Diels, Monogr. Afr. Pflz. **3,** 67 (1899)

C. arenarium Engl. et Gilg in Warb. Kunene-Sambesi Exped. 318 (1903)

C. argyrochryseum Engl. et Gilg, l.c. 320 (1903)

C. baumii Engl. et Gilg, l.c. 320 (1903)

C. gnidioides Engl. et Gilg, l.c. 319 (1903)

C. katangense De Wild. in Fedde Repert. **9,** 516 (1913)

C. stenophyllum R. E. Fries in Wiss. Ergebn. Schwed. Rhod.-Kongo Exped. 1911-12, **1,** 170 (1914)

C. wittei Exell, in Rev. Zool. Bot. Afr. **21,** 89 (1930)

We are concerned here only with the systematic position of the suffrutescent species ; the problems of their biology and evolution require further research. It is however interesting to note that the suffrutescent habit has evidently arisen in four sections of the genus, two of these sections consisting predominantly of savanna trees, and two predominantly of forest shrubs and lianes.

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Engler, A. & Diels, L. (1899) Monographieen afrikanischer Pflanzen-Familien und Gattungen **3,** *Combretaceae-Combretum.*

Le Testu, G. & Exell, A. W. (1936) Les espèces de *Combretum* de l'Afrique Occidentale tropicale dans l'herbier de M. Le Testu. *Bull. Soc. Linn. de Normandie*, sér. 8, **9,** 117-144.

Linum*.—The importance of this genus, as the botanical source of flax and linseed (*Linum usitatissimum*) and of various garden or ornamental plants, needs no emphasis. With the world shortage of many vegetable fibres and oils increased attention has been paid to both flax and linseed in many parts of the world, including the British Isles. In Britain the use of improved varieties of linseed and of a better understanding of the cultural requirements of the crop under British conditions, especially the need for clean or weed-free land, has greatly increased the average yield with this crop. It is therefore fitting to record the appearance of a work by Prof. Ciferri of Bologna devoted to the genus *Linum*.

The first pages deal with the family *Linaceae* as a whole and its geographical distribution, the latter being depicted by a series of maps. There are also sections on anatomy, with special reference to fibre structure, on genetics and chromosome numbers in the genus *Linum*, and on the antiquity of flax and linseed in the Mediterranean region. The more important species of *Linum* are dealt with at some length with line drawings to illustrate the habit and other characters. A useful bibliography of some 250 entries accompanies the work.

F. N. HOWES.

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*La Sistematica del Lino. By Prof. R. Ciferri. Pp. 203+Fig. 89. Bologna : Anonima Arti Grafiche, Piazza Calderini, 4 : 1949.

A NEW EULALIA FROM BURMA.

N. L. Bor.

Eulalia bicornuta *Bor*, sp. nov., *E. pallenti* O. Ktze. affinis sed ab ea gluma spiculae sessilis inferiore bimucronulata, spiculis rhachidibusque minus pilosis differt.

Gramen perenne, caespitosum. *Culmi* usque 100 cm. alti, graciles, teretes, glabri laevesque, striatuli. *Foliorum laminae* lineari-acuminatae, usque 20 cm. longae, 2·5 mm. latae, apice setaceae, planae vel plerumque involutae, subtus laeves glabraeque, supra tomento denso albo tectae; *vaginae* arctae, culmos complectentes, laeves glabraeque, striatulae, inferiores coriaceae, emortuae et a culmo demum in fibras solutae, superiores laminas brevissimas vel rudimentarias gerentes; *ligula* membranacea, angustissima.

Racemi 2–3, usque 10 cm. longi; pedunculus brevis, glaber, laevis, breviter exsertus; rhachis fragilis; articuli 3 mm. longi, superne clavati, articulatione obliqua, sectione triangulares, angulis ciliati; pedicelli 2·25 mm. longi, marginibus duobus pilis superne usque 1·5 mm. longis inferne pilis brevioribus ciliati; spiculae sessiles et pedicellatae similes, aureo-brunneae, aristatae, 3·5–4 mm. longae. *Spicula sessilis*; *gluma inferior* elliptico-oblonga, 2-nervis, bicarinata (carinarum nervis in dentes duos curvatos productis), dorso laevis, inter carinas depressa, dorsi media parte longe hirsuta, superne inferneque glabra; *gluma superior* ambitu lanceolato-oblonga, navicularis, apice truncata, 3-nervis, carina glabra, lateribus inferne hirsuta, ceterum glabra, laevis, apice vel infra apicem breviter aristata; arista 2–3 mm. longa. *Anthoecium inferius* vacuum; *lemma* hyalinum, 2·5 mm. longum, oblanceolatum, *palea* brevissima, oblonga, hyalina. *Anthoecium superius* ⚥; *lemma* oblongum, 2·5 mm. longum, angustissimum, 1-nerve, apice fissum, inter lobos acutos aristam 7–9 mm. longam inferne tortam auream emittens; *palea* apice truncata, lata, ovato-elliptica, hyalina, 1·5 mm. longa, 1·5 mm. lata; *stamina* tria, purpurea; *antherae* 2·25 mm. longae; *styli* 2; *stigmata* plumosa, purpurea; *lodiculae* 2, cuneatae, parvae, 3-dentatae. *Spiculae pedicellatae* spiculis sessilibus similes sed gluma inferiore hirsutiore paullo recedit.

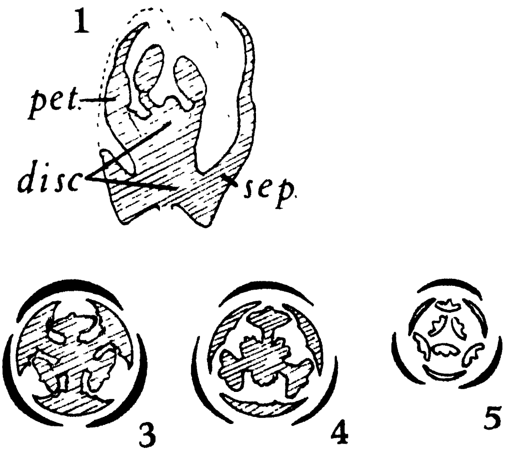
Burma. Kaukkwe Valley, Nansonli Reserve, Myitkyina District, 130 m., 22 Nov. 1912, *J. H. Lace* 6051. "This together with No. 6052 covers a great deal of the open spaces in a poor sort of indaing composed chiefly of Quercus ? mespilifolia, ingyin, Tristania burmanica, Buchanania, Terminalia tomentosa, Wendlandia etc." Lace's No. 6050 also from the same area is *Eulalia trispicata* (Schult.) Henr. which *E. bicornuta* resembles superficially to a remarkable degree. In fact to separate the two the 2-horned lower glume and the awned upper glume of *E. bicornuta* must be made out, but the two grasses resemble one another so closely as to suggest that the latter species is probably far more common than collections would lead one to think. (Typus in Herb. Kew.).

A NEW DIOSCOREA FROM THE CELEBES.

I. H. Burkill.

Dioscorea (Enantiophyllum) sexrimata *Burkill* sp. nov. ; propter conjunctiones inter torum tumidum et latera interiora petalorum filamentorumque singularis, nisi *D. sarasinii* Ulinei similis sit his partibus. *D. sexrimata* differt a *D. sarasinii* dispositione spicarum fertilium masculinarum quae in ramos aphyllos ad 16 cm. longos collocatae sunt, quando quidem contra spicae masculinae omnes *D. sarasinii* in fasciculis amplis ad axillas foliorum coactae sunt.

Partes inferiores ignotae. *Planta* glabra. *Caulis* tenax, ad 2 mm. crassus, fere laevis. *Folia* inferiora opposita, remotiora alterna : lamina subcoriacea, lanceolata, etiam in foliis plerisque late lanceolata, basi saepe accurate rotundata vel latissime obtusa, ad 12 cm. longa, ad 3 cm. lata, 5-nervis, nervis extremis submarginalibus, nervis omnibus infra distinctis, margine leviter indurata : petioli longitudo quartam partem laminae aequans vel brevior. *Rami masculini* fertiles ex axillis foliorum supremorum singuli, folia parum excedentes vel foliis breviores, sat laxi internodiis 10-30 mm. longis. *Alabastra* paullulo elongata, basi more sellae equestris ad axin appressa. *Torus* floris latus, ambitu subtriangularis, sepala suppeditans margine, centro conico-tumidus et sex-radiatus ob fulcra tria in partibus inferioribus petalorum et tria adjuncta in partibus inferioribus filamentorum ante-sepalorum infixa, qua auxilio petalorum staminumque sex celliculas limitant (vide fig. 3). *Petala* ut plurimum incrassata, sed margine tenuia, facie interiori bilineata. *Stamina* biserialia ; stamina ante-petala os floris fere attingentia ; stamina ante-sepala paullulo deficientia : filamenta antheris aequilonga vel brevia. *Gynoecium* sine conformatione pertinente. *Flos foemineus* ignotus.



Dioscrea sexrimata Burkill. A vertical section through a flower showing the swollen disc which makes a saddle over the axis, and extends upwards with the petals and ante-sepaline filaments adnate ; and transverse sections at four different horizons. In the second of these the six channels between the petals and ante-sepaline filaments are seen, virtually closed, and it may be that they are ways by which honey at the base of the flower can be reached by visiting insects.

Capsularum delapsarum valvae ad 22 mm. longae ; alae ad 18 mm. latae ; apex quodam modo retusus ; basis in stipam 6–7 longam extensa. *Semina* non visa.

CELEBES. Liasa, ad 300 m. alt., inter arbusculas consociatas, *Kjellberg* 2262 ♂ ; Kendari septentrionalis, ad 300 m. alt in sylvis pluviosis, *Kjellberg* 671 ♀. Floret in mense Septembri. Typi in herbario Horti Botanici ad Bogor conservati.

The cousins Paul and Fritz Sarasin collected *D. sarasini* Uline in the northern limb of Celebes ; *D. sexrimata* was collected in the south-eastern limb. *D. sarasinii* was described (R. Knuth, Dioscoreaceae, p. 291 : 1924)—as having the inner stamens connate to the gynoecium : but it may be that actually the structure of the flower resembles more closely that of *D. sexrimata* than Dr. Knuth's description suggests. Further studies must be awaited. The two species differ in the arrangement of the male flower-spikes, *D. sarasinii* having them in large fascicles in the axils of leaves ; *D. sexrimata* having them spread over an elongated more or less leafless branch or stem end. The first named was figured by Dr. Knuth and figured again rather more accurately in the Annals of the Royal Botanic Garden, Calcutta (XIV, pl. 109).

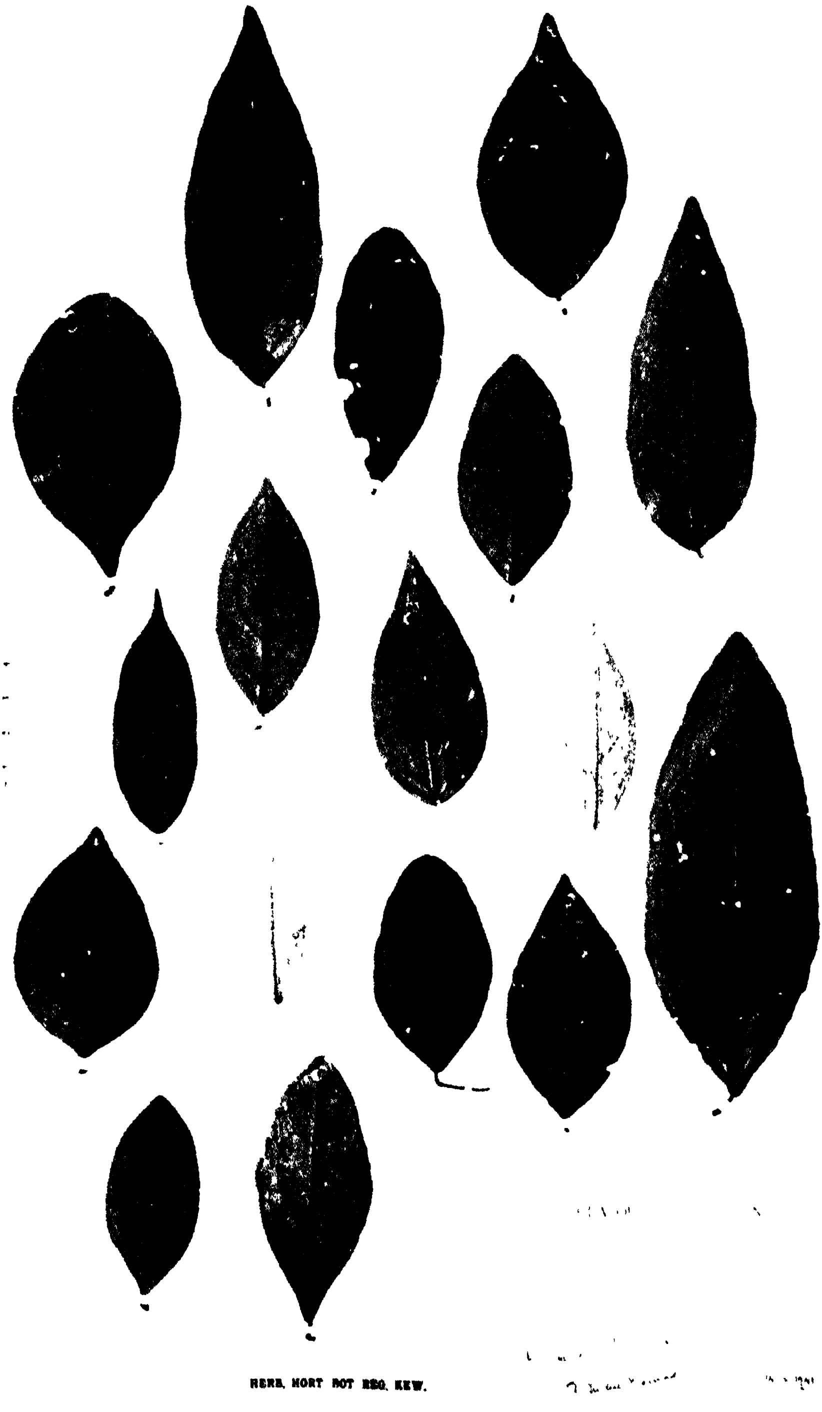
The structure of the flower is difficult to comprehend without the use of the diagrams given here. The torus grows upwards, much as in a Rubus, but lifts the petals and stamens ; and in its growth it enlarges their insertion by retaining a bridge of tissue to the inner face of the petals and the inner face of the ante-sepaline stamens ; and between the six radial walls that may be seen at the appropriate horizon are six channels with a narrow or obliterated chink opening outwards.

In the section Enantiophyllum it is not unusual for the base of the flower to consist of tissue which appears to be a small water reservoir used to equalise turgidity during anthesis. But in no species but these here named, is it extended upwards with the appearance of adnation between petals, stamens and gynoecium.

MR. C. T. WHITE

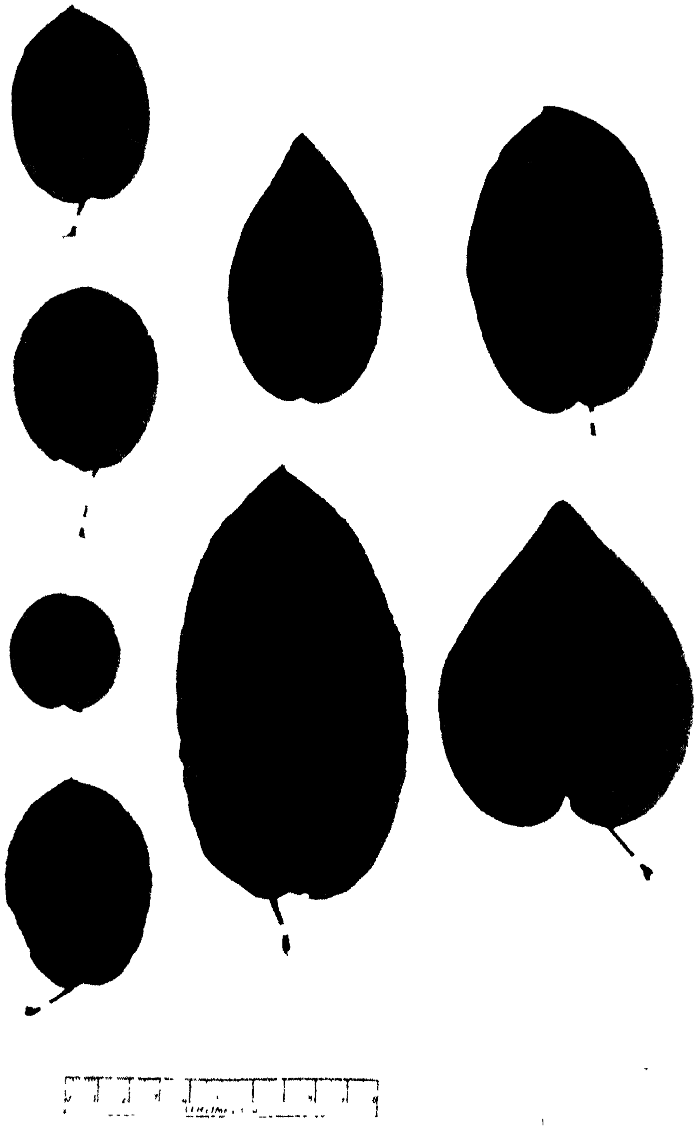
It was with great regret that we learnt of the death of Mr. C. T. White, the distinguished Government Botanist of Queensland, on August 16th. He was always a welcome visitor at Kew, and had expected to visit us again in 1951. An obituary notice will appear in our next number.

PLATE 8.



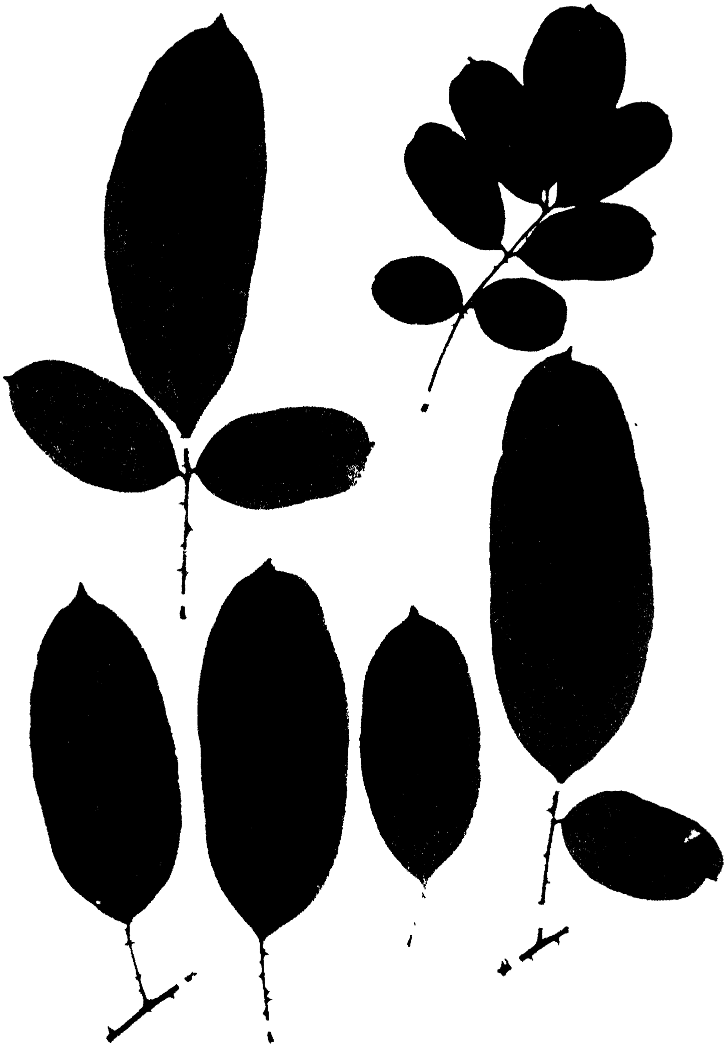
Capparis erythrocarpa Isert

PLATE 9.



Triclisia subcordata Oliv.

PLATE 10.



Fagara xanthoxyloides Lam.

VARIATION IN LEAF-SHAPE WITHIN A SPECIES: SOME EXAMPLES FROM THE GOLD COAST

Whilst at Achimota College in the Gold Coast in 1941, I was enabled to become familiar with the constituent species of shrubs forming the evergreen thickets of the dry coastal belt, and I was much struck by the high degree of variation in leaf shape and size that was to be found within a species, or even on different parts of a single individual plant.

A selection of leaves from a single individual bush of each of three unrelated species are shown on the accompanying plates. Plate 8 shows leaves from a bush of *Capparis erythrocarpa* Isert (*Capparidaceae*) with shapes varying from obovate, through elliptic to ovate and lanceolate, with apices varying from sharply acuminate to obtuse, and bases from cuneate to rounded. Even the venation varies considerably in the degree of development of the upper primary lateral nerves. In some cases, where these are largely suppressed, the leaf has a three-nerved appearance reminiscent of *Strychnos*.

Plate 9 shows a series gathered from an individual plant of *Triclisia subcordata* Oliv. (*Menispermaceae*). Here again both the general shape as well as the shapes of the apex and the base show enormous variation, considerably greater than the differences given to separate *T. dielsii* Hutch. & Dalz. from *T. subcordata* in the Flora of West Tropical Africa (**1,** 72 : 1927). As there are no obvious floral differences to separate these two species and as the only known locality for *T. dielsii* comes well within the range of *T. subcordata* and both inhabit similar country, I have no hestitation of reducing *T. dielsii* to the synonymy of *T. subcordata.*

My third example, shown on Plate 10, is *Fagara xanthoxyloides* Lam. (*Rutaceae*), a species normally with pinnate leaves, but which not infrequently produces simple leaves or leaf with a reduced number of leaflets. The simple, bi- or trifoliolate leaves here depicted would exclude the plant from *Fagara* in Hutchinson and Dalziel's key (l.c. 479 : 1928).

These examples, I think, demonstrate a very important point. Floras are prepared in herbaria and are based largely on herbarium specimens of the plants included therein. The field worker expects to find in a Flora some information as to the extent to which a species may be expected to vary. This information cannot be put into the Flora unless the collectors have supplied the botanist concerned with writing the Flora with the necessary information. It is therefore up to the collector to collect species so as to show the degree of variation, either within an individual bush or tree, or within a population. If collecting on these lines could be attempted, the resulting information would help to make future Floras more reliable and correspondingly more useful in the field.

E. Milne-Redhead

Flowers to know and grow*.—During 1949 the Castle Press published four little booklets on flowers of the seasons by Audrey Wynne Hatfield (see Kew Bulletin 1950, no. 1, p. 127). These little booklets were so well received that the publishers decided to bring them together under one cover. The result is a pleasing and interesting volume which amply justifies this decision. The opening chapters, which contain useful information on soils, propagation, planting, and history, are followed by an index and a list of flowering seasons. Each page of the book proper is headed by a delightful flower drawing, executed by the author, accompanied by a description and details of scent, varieties history and culture.

H. S. MARSHALL.

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*Flowers to know and grow. By Audrey Wynne Hatfield. London : Castle Press. 1950. Pp. 174. Price 12/6.

Commercial Glasshouse Crops*.—The author, who is Director of the Experimental and Research Station, Cheshunt, situated in the centre of a large market gardening district, has devoted many years to the problems of the Glasshouse Industry and his book on the commercial cultivation of crops under glass will be welcomed by all those interested in the subject.

In his preface Dr. Bewley states that the book came to be written as a result of the insistence of his grower friends, who seemed to think he could produce something of interest that would prove useful to the Glasshouse Industry as a whole. In this book he has fully justified their confidence and the practical instruction on the management and culture of glasshouse crops should prove helpful not only to the experienced grower but also to the amateur.

The book opens with a chapter on planning and building a nursery, and deals with the many important points such as district, site, soil types, water supply, distance from rail-head, the construction of glass houses and methods of heating. This is followed by some forty-two pages on the soil, in which the subject is thoroughly dealt with and attention paid to such matters as the physical and chemical aspects, the effect of nitrogen, phosphate, potassium and other elements upon the plant, air and water in the soil, fertilizers, plant nurseries and soil warming.

Chapters on commercial glasshouse crops include tomatoes, cucurbits and vegetables, fruit crops, cut flowers, bulbs and pot plants. Not only are exhaustive cultural details given but also interesting notes on the history and the best varieties to grow. The important question of diseases, pests, and their control, is dealt with in a very able manner. Methods of control such as protection against the introduction of infected material, the elimination of infection centres, the use of resistant varieties, adjustment of the environment, sterilization of the soil, disinfection of the glasshouses, fungicides and insecticides, are carefully described and much useful information supplied. The concluding chapters are devoted to an historical survey of the industry and the recent applications of science to glasshouse crops.

A feature of the work is the number of excellent reproductions of photographs, many of which, illustrating the various operations in cultural methods, will be found extremely useful. The book which is well produced is provided with a useful index. H. S. MARSHALL.

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*Commercial Glasshouse Crops. By W. F. Bewley. London : Country Life Limited. 1950. Pp. xii. 509. Price 50/-.

A NEW MALVASTRUM FROM THE PERUVIAN COAST.

N. Y. SANDWITH.

Among the many interesting plants collected in Peru by Mr. Christopher Sandeman is a very unusual and attractive species of *Malvaceae* which he found in the Lomas zone on the coast at Chala, between Lima and Mollendo. This plant is unmatched in the Kew material of this family, nor is it accounted for in the recent papers of Ulbrich, Johnston and other writers. Nothing like it is mentioned in Ferdinand Bruns' catalogue of the flora of the Peruvian coast, see Mitt. Inst. Allg. Bot. Hamburg, **8** (1929), nor in the lists of Weberbauer in his work, " El Mundo Vegetal de los Andes Peruanos " (1945). The description is as follows :

Malvastrum sandemanii *Sandwith*, sp. nov. ; nulla affinitate obvia, ob habitum, formam foliorum subsessilium, pedicellos longos graciles, absentiam bracteolarum, carpella glabra valde distincta.

Herba perennis ?, caulibus teretibus gracilibus ad 1·75 mm. diametro ad 30 cm. longis apice flexuosis dimidio vel triente inferiore nudis glabrescentibus superne copiose foliatis floriferisque et nonnunquam ex axillis foliorum breviter graciliter ramulosis purpurascentibus crebre sed satis sparse minute stellato-pubescentibus ; internodia 0·5–2·2 cm. longa ; stipulae filiformes, pilosulae, vix ad 1·5 mm. longae. *Folia* parva, subsessilia, petiolo ad 1 mm. longo, ambitu ovato hederiformi, scilicet prope vel paulo infra medium trilobata, tota 0·7–1·2 cm. longa, 0·5–1 cm. lata, lobo intermedio magno ovato acuminato lobis lateralibus multo minoribus deltoideis 1–2 mm. tantum longis, basi rotundata, supra griseoviridia subtus canescentia, utrinque stellato-tomentella, costa nervisque utroque ejus latere paucis 2–3 supra canaliculato-impressis subtus inconspicue elevatis. *Flores* secus totum caulem axillares, solitarii sed nonnunquam cum ramulo axillari brevi gracili inferne nudo apice foliifero floriferoque geminati ; pedicelli graciles, patuli, glabri, 2–3 cm. longi, 4–7 mm. infra apicem articulati, supra articulum sursum flexi. *Bracteolae* desunt. *Calyx* cupulari-campanulatus, extra satis dense stellato-tomentellus ; tubus 3 mm. longus, circiter 7 mm. latus ; lobi deltoideo-ovati, acuminati acutique, 3·2–3·5 mm. longi atque lati, marginibus subpurpurascentibus, intus secus margines atque dimidio superiore stellato-tomentelli. *Petala* roseo-lilacina, lamina late suborbiculari-obovata apice subtruncata sed latissime emarginata 1–1·1 cm. longa 0·9–1 cm. lata, ungue circiter 1·5 mm. longo longe molliter simpliciter piloso. *Staminum* columna 3 mm. longa, basi tantum zona pilorum mollium simplicium praedita ceterum glabra ; capitulum antherarum 4 mm. diametro. *Styli* columna 2–2·5 mm. longa, glabra ; rami 14–15, 2·5–3 mm. longi, apice capitato-stigmatosi. *Carpella* tot quot styli rami, glabra, laevia vel juventute dorso obscure transverse rugosula, exappendiculata, exaristata, uniovulata ovulo ascendente. *Fructus* non visus.

PERU. Dept. Arequipa : Chala region, growing in full exposure in small patches by the roadside in almost desert country at 1500 ft., April 1943, *C. Sandeman* 4020 (type in Kew Herb.) ; herb with pinkish lilac flowers and alternate grey-green leaves.

There is no fruit with the material, which must be referred for the present to *Malvastrum* on account of the position of the single ovule in each carpel. Nevertheless, the doubtful validity of this character as a means of distinguishing this genus from *Sida* has recently been exposed by Svenson, in Amer. Journ. Bot. **33,** 466 (1946). In habit and facies this interesting new plant of the Lomas formation suggests species of *Sida,* or even species of *Anoda,* rather than those of *Malvastrum,* but I have found no description agreeing with it.

American Wild Flowers.*—This book is the first of a series entitled " The New Illustrated Naturalist ", which is planned to cover all the main branches of the natural history of North America. If we are to judge from the present volume, this series will be very different in its aim and standards from our own " New Naturalist ". " American Wild Flowers " is frankly designed as a popularly written and copiously illustrated book for the nature-lover who can " go places " in his car, and describes the showiest and most interesting herbaceous plants occurring wild in the United States, Canada, Newfoundland, St. Pierre and Miquelon, Alaska and Greenland. The author sent a questionnaire to 1100 naturalists scattered all over this area, asking them to list the 12 most showy, conspicuous and interesting wild flowers of their neighbourhood. In this way, more than 1000 different plants were nominated for treatment (*Lobelia cardinalis* easily headed this continent-wide poll) and, after carefully selected additions by the author, 2050 species, varieties and named forms were chosen for description while many others received incidental mention. The plants are dealt with by families, in the order of Hutchinson's system : many chapters are devoted to a single family, while the *Carduaceae* need no less than four, whereas the sedges and grasses are relegated to the chapter beginning with the *Agavaceae* and *Dracaenaceae.* Carnivorous plants and epiphytes each have a special chapter. The book concludes with a very short illustrated glossary, a useful list of terms used for describing pubescence, and a selected bibliography. As usual, the black and white photographs are much more successful than the colour illustrations.

The author writes simply and directly, but with enthusiasm. He not only discusses the botanical characters, habitat and distribution of his chosen flowers but also conveys a great deal of useful general information about the families and genera, methods of pollination, folk-lore, etc. One can imagine no better beginning for the English amateur flower-lover who is planning to visit North America, while botanists at home, particularly those who study our adventive flora, will find it a fascinating bedside book. They will look in vain for any mention of *Amaranthus* and *Ambrosia* (which troubled our evacuee children with hay-fever), but will be surprised when they read of the remarkable spread of certain immigrants from Europe such as *Hibiscus trionum* and *Abutilon theophrasti,* or of the abundance as a native of the familiar *Caltha palustris.* What a relief it is to have a book of this kind written by a professional botanist who loves his local flora, and to know that one's enjoyment will not be derived from the spotting of howlers and misprints ! The author is on less sure ground when his mind takes flight across the Atlantic : *Galinsoga parviflora* (not *G. ciliata*) was called " Gallant Soldier " here several decades before the London Blitz, nor did the " harassed Britishers " take any particular notice of the appearance of this genus in the ruins of their capital.

The outstanding feature of this book is the names of the flowers, especially the common names, with which almost every page is studded. The author obviously likes them, and they will give equal pleasure to those many people at all brow-levels who are susceptible to the charm or comedy of common names. The spelling is in accordance with the latest edition of *Standardised Plant Names*, issued by the American Joint Committee on Horticultural Nomenclature. The application of rules for spelling compound names produces sights and sounds amusing to English eyes and ears : thus we have " waterarum ", " cattail ", " clamshell-orchid " and " Jerusalemartichoke ", and such engaging oddities as " fiddlerstrumpet " and " low-bachelorsbutton ". " Oxslips " is not a slip, and " midasears " will probably have to be explained to the present generation. English readers will recognize " anemony " and " lupine ", but who would know that Chapter 38, headed " Paintbrushes, Beard-tongues, Turtleheads, and Little Elephants ", was devoted to *Scrophulariaceae* ?

As for the Latin names, a serious protest is called for against the author's minute generic splitting, especially in a book of this kind. He seems to enjoy maintaining or reviving names almost universally neglected for some of the commonest and best-known plants. This practice he defends in his introduction with the remark that, " No one can say that one point of view is right and the other wrong. Both are absolutely essential for a balanced and thorough understanding of nature in its infinite complexity ". Yet Sir William Wright Smith has recently reminded us that, " It may well be that a genus can be divided, but that is not in itself a reason for its division. Many things are divisible, but it is not always expedient or proper to divide them (when it is not necessary to make a change, it is necessary *not* to make a change)." It is good to stress that living organisms are dynamic and do not fit easily into man-made categories, but it is dangerous to suggest to beginners in any school that they will acquire a balanced view by believing that every judgment may be equally right where opinion is not unanimous. And what possible good can come of training them to associate London Rocket, Bindweed, Spanish Moss and *Hibiscus trionum* with such names as *Norta irio*, *Strophocaulos arvensis*, *Dendropogon usneoides* and *Trionum annuum* ? In such company *Draba verna* looks oddly old-fashioned. Besides, there are the International Rules, and the author has no " right " to continue the use of the rejected name *Parosela*, while everyone should deplore the discovery of *Campe* as a substitute for *Barbarea*. Let us hope that Dr. Moldenke will write further books for amateurs in which he will turn his back on generic splitting and will also lay more emphasis on the very frequent and significant unanimity among botanists over such matters as the size of genera and the rank of plants.

N. Y. SANDWITH.

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*American Wild Flowers. By Harold N. Moldenke, Ph. D. Macmillan & Co., Ltd., London ; D. Van Nostrand Company Inc., New York, 1949, pp. 453, pl. 32 four-colour and xxxii gravure. Price 35s., $7.

KOENIGIA ISLANDICA IN BRITAIN.

B. L. BURTT.

Koenigia islandica L., a small annual member of the family *Polygonaceae*, was collected by Mr. H. M. Montford and Dr. Montford (Dr. Nellie Carter) at 2300 ft. near the summit of The Storr on the isle of Skye on 31st August 1934. It was casually labelled *Peplis* and was laid into that genus in the Kew herbarium. There it had been hidden till a short while ago when a chance examination of the *Peplis* material brought it to light. This appears to be the first record of the species from Britain and its most southerly station in Europe.

In general terms *Koenigia islandica* may be said to have a circumboreal distribution, though it reaches as far south as the Himalayas in central Asia. There is a very closely allied form, which may be conspecific, in the Southern hemisphere on Tierra del Fuego (*K. fuegiana* Dusen). For a more detailed statement of its range I cannot do better than quote from Dr. E. Hultén, Flora of the Aleutian Islands (p. 154 : 1937) :—

" Europe : from Jan Mayen, Spitzbergen and Nova Zembla southwards to Iceland, Faeroe Islands, central Scandinavia and arctic Russia. Asia : along the Arctic Coast to Chukch Penins, and southwards to Jakutsk. distr., the northern Kuriles (Onekotan) and Commander Is. Also in the central Asiatic mts. southwards to Tibet, Kashmir and Szech'uan. N. Amer. : N. Alaska (Kotzebue Sd) to Baffin Land and Labrador southwards to the Pribilof Is., the eastern Aleutians, S.E. Alaska and Alberta (Smoky R. acc. to Macoun), E. & W. Greenland, S. Amer. : Tierra del Fuego."

Clearly the station in Skye can be regarded as a not improbable outlier of that part of the range which includes Iceland, the Faeroes and central Scandinavia.

The habitats favoured by this species are damp rocks and mud and stream-banks. Mr. Montford writes : " The other plants I collected from the locality were *Juncus biglumis*, *Carex oederi* [i.e. *C. demissa* Hornem.] & *Cherleria sedoides*. There is not much bare rock on The Storr, but a good deal of bare peaty mud towards the summit. The " peak " is just the highest point on a long steep escarpment facing East. To the West is a gentle dip slope, *Scirpus caespitosus* bog, very wet." In Iceland it is reported on the banks of hot springs whose water is at 70° C. It is an interesting plant in that it has a more arctic distribution than perhaps any other annual.

*Koenigia islandica** is a small annual plant usually about 2–6 cm. high, though growing up to 15 cm. in some parts of its range. The lowest leaves are subopposite the intermediate ones alternate, the uppermost subopposite or clustered below the flowers. The lamina is obovate-oblanceolate, about 5 mm. long and 3 mm. broad, subsessile or with a very short petiole ; the stipular sheath (ochrea) is short. The flowers are small, fasciculate among the upper leaves, and shortly pedicellate. The perianth is deeply 3-lobed, the stamens 3 in number and the angled ovary develops to a typically polygonaceous trigonous nutlet.

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*For illustrations see :—Fl. Danica, 3 : t. 418 (1768). Svensk Botanik, 8 : t. 513 (1819). Britton & Brown, Ill. Fl. Northern States & Canada, ed. 2, 1 : 647 (1913)—as *Macounastrum islandicum* (L.) Small. Stefansson, Fl. Islands, ed. 2, 89 (1924). Lindman, Bild. Nord. Fl. ed 2/3, Suppl. t. 640 (1926).

MARINE ALGAE FROM THE GOLD COAST I.

C. I. Dickinson and V. J. Foote.

This initial list of Marine algae from the Gold Coast is based on collections obtained by one of the authors (V. J. F.)during brief expeditions made at intervals since 1939.

While the whole coast-line was originally surveyed, actual investigations were confined to a region roughly 230 miles long lying between the Ancobra and Volta rivers, because further east and west of these rivers only sandy and relatively inaccessible beaches are found.

Most of the collecting grounds are sandy beaches with large surf-washed rocks partially exposed at low tide, or headlands with ledges and large protruding boulders, still washed by strong waves during low tides. Conditions are generally unfavourable for algal growth, and as most of such algae as are found occur on the vertical sea-washed faces of boulders, collecting is both difficult and dangerous.

As might be expected on this type of shore, the flora is an impoverished one. We hope, however, that with further study this present list may be extended, and become at least more complete than any which has yet appeared for neighbouring coastlines. This part of the tropics is algologically speaking practically unknown.

Prampram is the only beach which it was possible to work systematically during the war years. Other beaches were subsequently made more accessible by the building of motor roads, and were visited for the first time in 1948 and 1949.

At Prampram there is a steeply shelving sandy beach, dipping down to the rock covered surface of the intertidal zone. West of the Castle this zone flattens out to an almost level surface, with long interrupted masses of horizontal rocks lying roughly parallel to the foreshore. This area was selected for study, and mapped along a base-line of 700 ft.

The long parallel masses are isolated by sandy stretches, with occasional large isolated rocks.

In these sandy stretches the basal rock is never very far below the surface. The exposed rocks are always submerged at high tides. Three broad zones have been recognised proceeding from the lowest to the highest level, named Inner, Middle, and Outer Zones respectively.

In the early years of the War material was sent to the British Museum (Natural History), South Kensington, where Mr. A. Gepp and Miss L. Lyle worked on it and in spite of the then prevailing conditions succeeded in producing a provisional list of some 60 species. Most of this material was subsequently destroyed by enemy action before the identification could be confirmed.

One of us (V. J. F.) made the collection and wrote the field notes which accompany the systematic list. The other author (C. I. D.) is responsible for the determinations and drew up the systematic list.

Specimens are deposited in the Kew Herbarium.

Both of us are grateful to the Keeper of Botany, Natural History Museum, for kindly permitting the work to be transferred from his department to Kew. One of us (V. J. F.)is indebted to the Director and to the Keeper of the Herbarium of the Royal Botanic Gardens, Kew, for

permission to work in the Herbarium, to Professor Boughey of the University of the Gold Coast for advice and access to facilities and material, and to Professor T. M. Harris of Reading University for suggesting the investigation and for advice.

VALONIACEAE.

Struvea anastomosans (*Harv.*) *Piccone* in " Crociera del Corsaro alle Isole Madera e Canarie del Capitano Enrico d'Albertis 20 : 1884

Prampram Jan. '49, March '39, Oct. '41.

Light yellowish green bracket-like growths, crisp to the touch. In '39 one small patch was found on a Middle Zone rock. In '41 odd tufts had spread east of this rock in the same area but in '49, after the local inhabitants had removed the upstanding portions of the Inner Zone rocks, it came in very strongly all over the denuded bases of these, and similarly denuded rocks in the inner Middle Zone. In Nov. '49 it had disappeared from the Inner Zone, and only a few patches have been found on the outer Middle Zone rocks. It appears to do best in longitudinal crevices, on or near the tops of rocks where a certain amount of sand lodges, and on denuded surfaces where sand can lodge.

CAULERPACEAE

Caulerpa crassifolia (*Ag.*) *J. Ag.* Till Alg. Syst. I : 13 : 1872.

Winneba Feb. '49, Jan. '45. Prampram Jan. '49, Jan. '45, Nov. '48, Aug. '39, Apr. '41. Elmina Jan. '45, Apr. 45. Cape Coast Dec. '45.

Small grass-green patches of this alga occur frequently on wave-swept rocks in Outer and outer Middle Zones, and occasionally nearer in-shore on rocks in pools, where the larger breakers well in from time to time. In this last habitat they are occasionally in pure stands ; generally speaking they creep among a mixture of other algae, invariably on one corner of the edge of the rock on the exposed seaward face. Tends to turn yellowish-brown when pressed.

DICTYOTACEAE

Spatoglossum schroederi (*Mert*) *J. Ag.* Till Alg. Syst. V : 113 : 1872.

Prampram Jan. '46, March '49.

Dull olive-greenish brown fronds, about 6–9 ins. high. Growing on large rocks in the Middle Zone. Rather ragged in appearance.

Stypopodium zonale (*Lamour.*) *Papenfuss* in Botaniska Notiser 1940 : 205 : 1940.

Prampram March '49.

Found growing in Middle Zone in much the same manner as Spatoglossum which it resembles rather closely.

CHAETANGIACEAE

Galaxaura marginata (*Soland.*) *Lamour.* Hist. Polyp. Corall. flex. 264 : 1816.

Prampram Aug. '39, March '39. ♀.

Plants about 2–6 ins., average about 5 ins. Colour dull crimson, bright red at tips, shading to off-white or dirty yellow at the base. Sometimes the whole frond with the exception of the apices appears quite green, the colour being due to the presence of an epiphyte. In November the fronds appear very old and denuded except for the apices, which are rather swollen, bright red and irregular, looking as if they were régenerating. Fairly common all over the Prampram area, but usually as solitary plants or 4–5 growing in one pool. Either in shallow pools of sand-covered rock, where they may be half buried in sand, or in deep pools between large rocks, on the lower sand-covered edges.

BONNEMAISONIACEAE

Asparagopsis taxiformis (*Delile*) *Coll. et Herv.* in Proc. Amer. Acad. Arts Sci. 53 : 117 : 1917.

Prampram Sept. '43.

First found thrown up on the beach in a heterogeneous collection of weed, mainly *Sargassum* at a spot between Prampram and Ningo which we have named Sponge Point, because so many are thrown up there. Later found growing on the mapped area at Prampram in large tufts scattered over the outer part of the Middle Zone on large rocks. Fronds delicately plumose in appearance, about 4–5 ins. long, yellowish red and succulent, the main stipes being yellowish, and the ultimate ramuli crimson. The plants washed up appeared duller read, and some of the main stipes brownish from exposure.

Falkenbergia hillebrandii (*Born.*) *Falkenb.* Rhodomelaceen 689 : 1901.

Prampram Jan. '49.

GRATELOUPIACEAE

Grateloupia gibbesii *Harv.* Nereis Bor-Amer. II : 199 : 1853.

Prampram Sept. '43 ♀. Dec. '45, ♀.

Plants rare, found growing attached by a small basal disc to rocks covered by sand, or in the case of the Anamabu specimens, on the seaward face of a very large rock where the waves broke over them at low neap tides. The latter specimens were smaller, about 3–5 ins. The fronds a pale translucent rose with patches decidedly greenish in colour. They retained their colour well on drying. (Most of the Anamabu material is young and sterile. C.I.D.) The other specimens were much darker red with an olive tinge, larger, from 9 to 16 ins., and somewhat tougher in consistency.

Cryptonemia semi-nervis (*Ag.*) *J. Ag.* in Öfvers. K. Vet. Akad. Forhandl. Stockholm 11 : 1847.

Prampram Jan. '46 ♀, Nov. '48, Oct. '41, Sept. '43 ♀, May '39, July '39, ♀.

Plants anything from 2–6 ins. generally growing through a dense mat of a species of *Haliseris* under the overhanging tops of large rocks, which have been scooped out to form deep concavities. Also on the lower edges of these ledges, and on low-lying totally submerged rocks. Never exposed unless tides exceptionally low, and then continually wave-swept. Thalli bright crimson when young, older ones sometimes yellowish to olive green, with only ultimate tips crimson. Old plants often become very leathery and curled with numerous proliferations giving a crimped appearance ; often encrusted with Zoophytes, especially on stipe and lower portions of thallus. Young plants have a short stipe which broadens out fairly quickly and is either broadly rounded or sub-dichotomously branched at the tip which is the widest portion. In older plants the stipe may be an inch or more long supporting more than one thallus, and comparatively stout ; can be fairly satisfactorily dried without pressing. Quite common in the sub-littoral with outliers in the sub-littoral fringe and Outer Zone. November to February is a period of very low tides, and in November possibly for this reason, it appears to die down especially in the latter regions.

SOLIERIACEAE

Agardhiella tenera (*J. Ag.*) *Schmitz* in Flora 72 : 441 : 1889.

Prampram Jan. '46.

The plants were found on rocks in deep water in the Outer Zone. This is the only record so far. They form rose-red much branched bush-like plants about 4–5 ins. high. A similar plant gathered nearer shore in Labadi may prove to be the same.

GRACILARIACEAE

Gracilaria confervoides (*L*) *Grev.* Alg. Brit. 123 : 1830.

Prampram, Aug. '43, Christiansborg Oct. '41. ♀.

Plants variable, they may be filiform single or branched threads, yellowish purple-brown from 6–9 ins., growing through sand at the edge of the beach relatively exposed, in which case they are seldom branched ; or growing in shallow somewhat sheltered positions, when branching is common, the former are probably just impoverished forms. Latterly plants up to 18 ins. have been found at the edge of the sand, but well sheltered by rocks.

Large, 18 ins. plants very profusely branched and darker brown in colour were once found growing among other algae on large rocks in the Middle Zone at Prampram.

Gracilaria henriquesiana. *Hariot* in Journ. de Bot. 2nd Ser. I : 162 : 1908.

Prampram, Sept. '43.

Very ubiquitous, abundant all the year round ; a common and striking plant along the entire coastline. Forms dense fringes on the large rocks in the region between low Springs and low Neaps, usually thickest 3–6 ins. below the rock top, especially on the sides and inner landward faces. On the rock tops usually on the landward side of minor irregularities or deep crevices, fringing rather than growing upright. In mid and high tide areas, it may grow upright from rock tops, or, half buried in sand in shallow sand covered rock pools.

GIGARTINACEAE

Gigartina acicularis (*Wulf.*) *Lamour.* in Ann. Mus. d'Hist. Nat. 20 : 136 : 1813.

Christiansborg, Oct. '41.

Dark red-brown to olive when fresh, often with light yellowish cross striations giving a banded effect. Dries out purplish, later fading to red-brown. Cartilaginous filiform fronds irregularly branched, spreading over the rock in small patches. Ramuli few, secund and often strongly recurved. Softly cartilaginous when young, becoming hard and wiry when old. On tops of rocks near low tide mark and also further out in the Middle Zone.

RHODYMENIACEAE

Rhodymenia palmetta (*Esp.*) *Grev.* Alg. Brit. 88 : 1830.

Prampram, Aug.–Sept. '45.

Rare ; in small crimson patches generally growing with or near *Cryptonemia* on the overhangs of large rocks in the Outer Zone, not uncovered except at very low Spring tides, and then wave washed. Plants small, crimson, rather translucent, spreading over the rock surface forming a loose mat.

CERAMIACEAE

Centroceros clavulatum (*Ag.*) *Mont.* Exploration scient. de l'Algérie, Algues I : 140 : 1846.

Winneba Feb. '49. ⊕. Komenda Apr. '49. ⊕. Tantum Dec. '48. ⊕. Prince's Town Apr. '49. ⊕.

This species is very common and abundant all along the coast, varying somewhat in form according to its habitat. In Tantum and Prince's Town, where the foreshore is rocky with enormous boulders, the plants are usually rather short, about an inch long, growing in dense mats on the rocks, and of a rather pale yellowish colour except at the apices which are reddish-brown. On submerged rocks they are deep reddish brown.

DELESSERIACEAE

Taenioma perpusillum (*J. Ag.*) *J. Ag.* Sp. Alg. II : 1257 : 1863.

Sekondi Apr. '49. ♀. Prampram Jan. '49. ⊕.

The Sekondi specimens were growing in a hollow of a large rock at the sea edge, that is to say near where the rock platform ends. They formed a short blackish slimy mat whose individual plants were fine and in fruit. The Prampram specimens were collected with a mass of red epiphyte from the rocks of the Outer Zone on the east of the mapped area, which were exposed but wave washed for most of the time. It was impossible to tell them apart in the field, so they were roughly sorted into two bottles labelled red epiphytes and red epiphytes greenish at tip. These came from the former bottle.

Caloglossa leprieurii (*Mont.*) *J. Ag.* Sp. Alg. III : 499 : 1876.

Nr. Ancobra Apr. '49. ⊕.

Collected at low tide from stones and rocky bank at mouth of a stream near the Ancobra river, under the bridge on the western bank. The bridge shaded the rocks and no doubt at high tide they would be covered or at least continuously washed. When gathered it was rather dried out and seemed to be a small brownish black encrusting form, rather net-like in appearance.

RHODOMELACEAE

Polysiphonia ferulaceae *Suhr* in J. Ag. Sp. 11 : 980 : 1863

Prampram Apr. '41, July '41, Jan. '49, Sept. '43, ⊕, March '39, Oct. '41.

Sometimes almost covering the whole of a rock top, but more often in interrupted patches which may be quite extensive. Since the local inhabitants have been breaking down the upstanding portions of the rocks in the Inner Zone it has come in all over the low-lying denuded areas, right up near high tide mark. When young and when the older fronds are lifted by the tide the plants appear a reddish purple-brown, but when left exposed at low tide the full grown plants are about 3 ins. long and lie in dense masses like straight purplish black hair.

Bryocladia thyrsigera (*J. Ag.*) *Schmitz* in Falkenb. Rhodomelaceen 169 : 1901.

Christiansborg Aug. '39. Anamabu Dec. '45.

This species forms thick heavy fringes to large rocks which appear black in the mass, and brownish-green if individual fronds are isolated. Isolated plants sometimes grow on the sand covered rock bases, and the appearance of the whole plant is of a small bush with densely set linear leaves. Toughly cartilaginous, making it wiry and springy to the touch. A very striking and distinctive species. Common all along the coast where there are rocks protruding through a sand covered sea floor, and though often isolated usually very abundant on the rocks it grows over.

Lophosiphonia obscura (*Ag.*) *Falkenb.* Rhodomelaceen 500 : 1901.

Accra Oct. '41.

Growing on shale rock ledges about 5 ft. above ground level and sheltered by an overhanging cliff face which forms a shallow open cave. The species looks rather like a blackish, dried up, fine leaved moss forming a short felt on the rock.

Murrayella periclados (*Ag.*) *Schmitz* in Ber. d. deut. bot. Ges. XI : 227 : 1893.

Tantum Dec. '48.

Found in two different places, one lot of plants were growing on the byssus threads of mussels attached to a large rock ; the second gathering was from the overhang of another large rock in the mid-tide zone where the sea washed up a gulley around the base of the rock. The roof of the cave formed by the overhang is generally splashed and sometimes immersed by the waves sluicing through the gulley. The plants form a moss-like close fitting felt over the face of the rock.

Bostrychia tenella (*Vahl*) *J. Ag.* Sp. Alg. II : 869 : 1863.

Prince's Town Apr. '49. ⊕. Komenda Apr. '49.

On large fallen rocks at the base of the headland on which Komenda College stands.

The rocks lie in a tumbled mass at the foot of the cliffs and the plants seem to prefer the flat surfaces of those whose strata have been displaced from the horizontal to the vertical. The Prince's Town specimens are similar in appearance and also grow on the cleavage face of a large boulder in a sheltered spot at the foot of the hill on which the castle stands.

Laurencia papillosa (*Forsk.*) *Grev.* Alg. Brit. LII : 1830.

Winneba Jan. '45. Iture (Nr. Elmina) Apr. '45.

Plants with coarse yellowish rather stiff main branches ending in reddish rather bulbous ramuli ; the whole plant having a turgid appearance. Cartilaginous and brittle, on wave washed rocks all over the intertidal zone ; forming small shrubby clumps conspicuous on the tops of the rocks.

NOMOCHARIS AND LILIUM.

J. ROBERT SEALY.

Introduction.

The genus *Nomocharis* Franchet was established in 1889 (Journ. de Bot. **3,** 113, t.3) to accommodate a plant found in western China by the French missionary and plant-collector the Abbé Jean Marie Delavay. This plant, *Nomocharis pardanthina* Franchet, differed so strikingly from *Lilium* by its flat perigone with conspicuously erose inner tepals, by the dark-coloured base of the inner tepals ornamented with a number of low ridges of tissue flabellately arranged, and by the stamens with thick fleshy sub-cylindrical filaments bearing at the top a needle-like awn on the end of which the anther is attached, that it undoubtedly deserved generic distinction (see fig. 1, A-C). Four other species agreeing with *N. pardanthina* in essential characters have since been described, namely *N. meleagrina* Franchet, *N. mairei* Lévl., *N. basilissa* Evans, and *N. farreri* (Evans) Harrow (see Bot. Mag. sub t. 9557 : 1939). In 1918 Sir Isaac Bayley Balfour widened the scope of *Nomocharis* to include species which, until then, had been placed in *Lilium* or *Fritillaria* (Trans. Bot. Soc. Edinb. **27,** 273-300), while in 1925-6 E. H. Wilson (Lilies E. Asia, 13 : 1925) and W. E. Evans (Notes Roy. Bot. Gard. Edinb. **15,** 1-46, t. 199-212 : 1925 ; 191-197, t. 218 : 1926) carried Balfour's concept of *Nomocharis* to its logical conclusion. The result of this widening of the limits of the genus was, however, to blur the differential characters separating *Nomocharis* from *Lilium*, as was clearly explained by Mr. Evans himself in the following passage which appeared in Woodcock & Coutts, Lilies, 225 (1935) :

> " Your request for an up-to-date description of *Nomocharis*, sufficient to bring out its differences from *Lilium* and *Fritillaria*, has given me a task approaching the impossible. The truth is that the characters originally attributed to *Nomocharis*, as constituted by Franchet for the two species then intended to fill it, have gone, one by one, till there is hardly anything left between it and *Lilium*, except the generally more patent tepals and, I think, the usually shorter anthers in *Nomocharis*. Even as regards these two points there are exceptions . . . . "

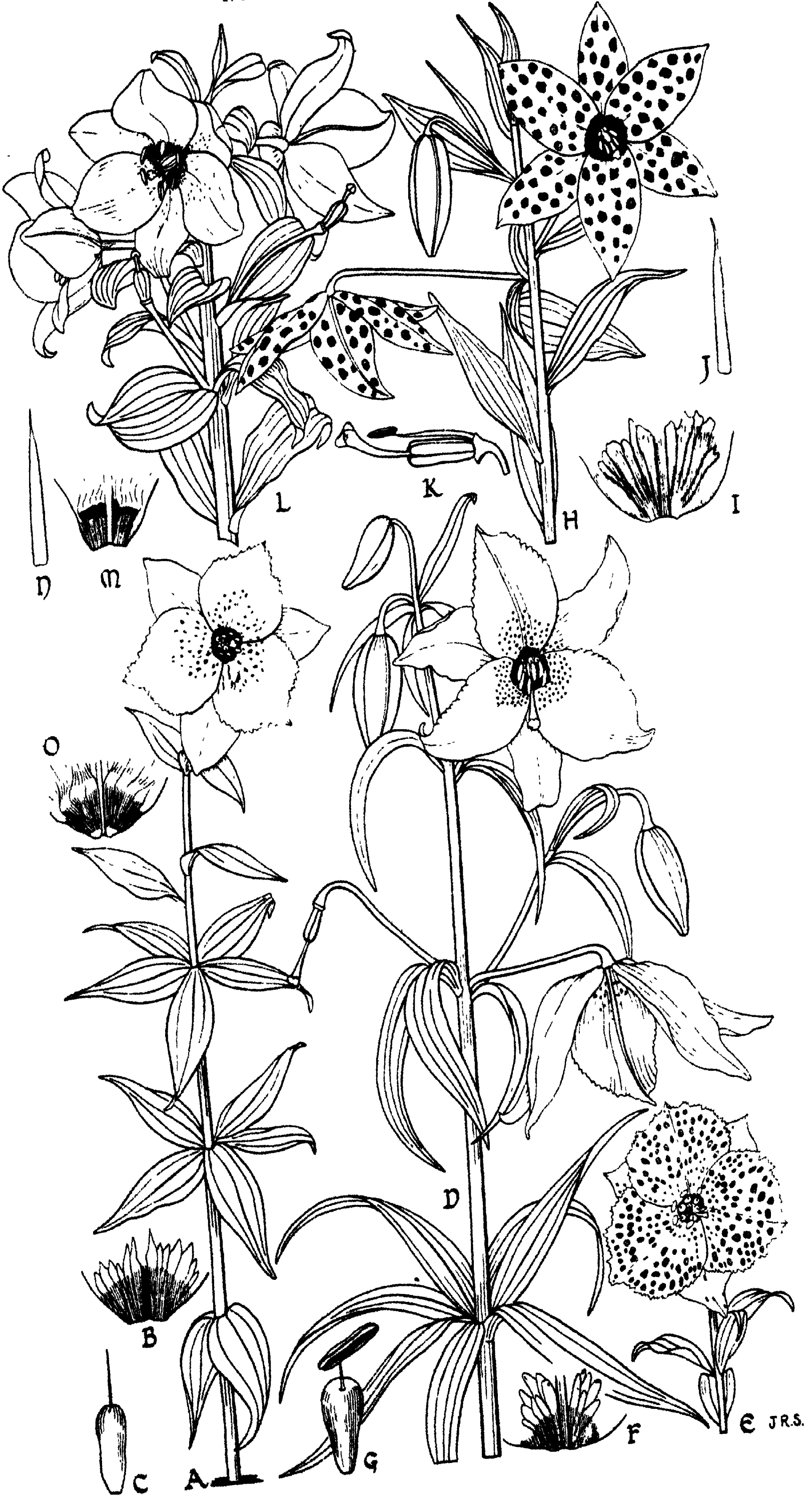
In the spring of 1948 plants of a " new Nomocharis ", grown from seeds collected by Capt. F. Kingdon-Ward in Manipur, flowered for the first time in English gardens, and in the course of an investigation into the taxonomic position of these plants, it became necessary to consider the problem of distinguishing *Nomocharis* from *Lilium*. It quickly became evident that certain species included in *Nomocharis* appeared to form a series connecting the true *Nomocharis* species to *Lilium*, and that the inclusion of some of these species in *Nomocharis* rather than *Lilium* was open to question. It therefore seemed advisable to examine the relationships of these " intermediate " species, but before this could be done it was necessary to consider what characters could be regarded as of generic value for the separation of *Nomocharis* sensu stricto (i.e. *Nomocharis* sect. *Eunomocharis* Balf. f.) from *Lilium*. The problem of distinguishing the two genera therefore falls into two parts, first consideration of the generic characters and secondly examination of the position of the doubtful species ; and it is dealt with below under these two headings.

Generic Characters.

Lilium, as generally defined now-a-days, that is, excluding the plants placed in *Notholirion* and *Cardiocrinum* and those which have been referred to *Nomocharis*, embraces a heterogeneous assemblage of species exhibiting a wide range of variation. The plants may be from one foot to six feet in height ; the leaves may be scattered or crowded, alternate or whorled, and from broadly ovate to linear and grass-like ; while the stem may carry from one to many flowers. None of these characters provides generic criteria so far as *Lilium* and *Nomocharis* are concerned, nor do the fruits and seeds. Attention has therefore been directed to the form of the bulb and the characteristics of the individual flowers. The various features can be conveniently dealt with under separate headings as follows :

(1) BULBS. A very wide range of variation in shape, size, colour, structure, and mode of renewal, is found in the bulbs of *Lilium*. Commonly the bulb consists of scales which increase in size upwards and inwards and overlap one another only in the lower part, so that they are all visible and form a more or less regular pattern over the whole bulb—e.g. *L. candidum*, *L. longiflorum*, *L. hansonii*, *L. pyrenaicum*, *L. maculatum*, *L. superbum*, *L. philadelphicum*, *L. canadense*, etc. This is the type of bulb generally accepted as " typical " of the genus, and the shape may be anything from wide ovoid to depressed globose. In many species, however, the bulbs are not of this type. Instead they have their outer scales subequal to the rest (that is, the outer scales vary from a little shorter than, to a little longer than, the inner), and since the scales are erect or ascending, the outer enclose and more or less hide the inner, the latter being visible, if at all, only in the apical part. Bulbs of this type vary greatly in size and shape, and in the number and size of their scales ; they may be oblate with numerous wide scales (*L. leucanthum*), or ovoid-oblate with relatively few wide scales (*L. cernuum*, *L. callosum*, *L. davidii*), or ovoid-globose with numerous broad (*L. ochraceum*) or narrow (*L. pomponium*, *L. bolanderi*) scales, or the bulb may be globose with elongated scales (*L. tigrinum*), or ellipsoid-ovoid with wide scales (*L. amabile*) or with numerous long narrow scales (*L. regale*), or it may be wide ovoid to globose with ovate to lanceolate scales (*L. amoenum*, *L. bakerianum*), or ovoid with few wide scales (*L. pumilum*), or ovoid with numerous lanceolate scales (*L. sempervivoideum*), or the bulb may be noticeably elongated with relatively few narrow scales (*L. polyphyllum*) ; then there is *L. catesbaei* with an elongated bulb formed of relatively few narrow truncate leaf-bases, and finally there are the " bulbs " which consist of numerous crowded erect narrow scales arranged along a short rhizome (e.g. *L. washingtonianum*, *L. parryi*, *L. columbianum*, and *L. humboldtii*). In addition, there are lily bulbs more or less intermediate in structure between those in which all the scales are visible and those in which the outer scales more

FIG. 1. **A–C,** *Nomocharis pardanthina*, **A** plant, × ½, **B** base of inner tepal, × 2, **C** filament, × 2. **D,** *N. farreri*, upper part of plant, × ½. **E–G,** *N. mairei*, **E** flower × ½, **F** base of inner tepal, × 1½, **G** stamen, × 2. **H–K,** *N. synaptica*, **H** upper part of plant, × ½, **I** base of inner tepal, × 2, **J** filament × 2, **K** gynoecium and one stamen, natural size. **L–N,** *N. saluenensis*, **L** inflorescence, × ½, **M** base of inner tepal, × 2, **N** filament × 2. **O,** *N. aperta*, base of inner tepal, × 2.
D after Bot. Mag. t. t. 9557 ; **E–G** after drawings by Stella Ross-Craig ; **L** after Bot. Mag. t. 9296 ; remaining figures drawn from herbarium specimens.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or less enclose the rest. As regards colour, this varies from white (e.g. *L. longiflorum*) to yellow (e.g. *L. martagon*) or deep red-purple on exposure (e.g. *L. regale*). In some lilies the bulb-scales are markedly constricted, e.g. *L. medeoloides*, *L. dauricum*, *L. philadelphicum*, and *L. pardalinum*. Finally there is the question of the renewal of the bulb. In the majority of species of *Lilium* the new bulb arises in the axil of one of the scales of the existing bulb, but there are certain species (e.g. *L. canadense*, *L. superbum* etc.) in which the new bulb is formed at the end of a stolon which itself arose in the axil of a scale of the existing bulb. This synopsis of the range of variation in *Lilium* bulbs is not exhaustive, but it gives an indication of the great diversity to be found in the genus.

In *Nomocharis* the bulb varies from narrowly ovoid or oblong-ovoid to subglobose ; the scales are lanceolate to ovate, and the outer are larger than and enclose the inner. The bulbs are thus of the same type of construction as is found in *Lilium* ; they much resemble those of *L. amoenum*, *L. sempervivoideum*, *L. concolor*, *L. pumilum*, and *L. bakerianum*, and are not radically different from those of *L. polyphyllum*, *L. pomponium*, and *L. ochraceum*. It is evident that no distinction can be drawn between *Lilium* and *Nomocharis* on bulb-characters. In fact, various species of *Lilium* differ from one another more in the bulbs than do the species of the two genera.

(2) SHAPE OF THE PERIGONE. The flowers of *Lilium* species, like the bulbs, present an extraordinary range of variation. They may be long slender trumpet-shaped (e.g. *L. formosanum*), large funnel-shaped (e.g. *L. brownii*, *L. regale*), smaller and funnel-shaped (e.g. *L. bakerianum*, *L. rubellum*, *L. candidum*), small cylindric-campanulate (e.g. *L. bolanderi*, *L. grayi*), small funnel-shaped to cupular (*L. sempervivoideum*, *L. amoenum*), or the perigone may be funnel-shaped with the upper half of the tepals revolute (e.g. *L. monadelphum*, *L. ochraceum*, *L. polyphyllum*, etc.), or the tepals may be revolute for much of their length (sect. *Martagon*), or the tepals may spread widely and recurve as in *L. auratum*). In all these examples the flower is horizontal to nodding, but there are yet other species in which the flower is held erect, and in these the perigone may be vase-shaped (*L. maculatum*, *L. bulbiferum*), or more wide-spreading with the tepals narrowly clawed and widely separated at the base (*L. catesbaei*, *L. philadelphicum*), or very shallowly funnel-shaped with the sepals wide-spreading (*L. concolor*). Despite this wide range, the perigone in *Nomocharis* is unlike anything in *Lilium*. The tepals spread widely from the base or, at the most, are only slightly curved, so that the perigone is either quite flat or saucer-shaped (fig. 1). In addition the inner tepals are often conspicuously erose, though sometimes almost entire in *N. farreri*, and always entire in *N. basilissa*; they are notably spotted or blotched in all species except *N. basilissa*; and they are dark-coloured at the base, the dark areas forming, with the equally dark-coloured filaments, a prominent " eye " in the centre of the flower (fig. 1, A, D, E). The shape of the perigone and the markings of the inner tepals combine to give the flower the different appearance from everything in *Lilium*, and constitute a most obvious generic characteristic.

(3) NECTARIES. In the majority of *Lilium* species both the outer and inner tepals are narrowly grooved for some distance from the base, these

grooves being nectariferous. They may be quite bare as in *L. taliense*, *L. bakerianum*, *L. rubellum*, etc., or more or less densely bordered with papillae, e.g. *L. duchartrei*, *L. bulbiferum*, *L. davidii*, or the groove may be almost covered over by ridges of tissue on either margin as in *L. martagon*. The tepals are curved at the base, but in *L. ochraceum* and *L. taliense* the outer are clearly saccate. In *L. superbum*, *L. pardalinum*, and *L. occidentale* the inner tepals are sulcate but the outer are not ; instead the whole of the base of the outer tepals forms a short broad channel. In a small group of species comprising *L. bolanderi*, *L. grayi*, *L. canadense*, *L. parvum*, and *L. maritimum*, the inner tepals are shallowly channelled at the base, but the outer are not, their bases being strongly curved and green, and apparently nectariferous, but the surface is not grooved or channelled in any way. Finally there is *L. candidum* (the type-species of the genus *Lilium*) whose outer tepals have a small green nectarial area at the very base which is too short to be described as a groove or channel, and whose inner tepals have a short green channel.

In addition to the nectarial furrows, certain species of *Lilium* have irregular outgrowths from the nerves in the lower part of both outer and inner tepals. These outgrowths take the form of more or less erect linear or oblong processes or short low ridges of tissue which are sometimes lobed or branched ; they may be few in number and situated just beyond the distal end of the nectarial furrow as in *L. chalcedonicum*, or many and prominent and extending downwards on either side of the nectarial furrow as well as beyond it, e.g. *L. auratum*, *L. speciosum*, and *L. henryi*, or the outgrowths may be confined to the base of the tepals on either side of the nectarial groove as in *L. maximowiczii*, while in some forms of *L. bulbiferum* the outgrowths may form interrupted crests beyond or alongside the groove.

In *Nomocharis* the outer tepals are not nectariferous, or only slightly so at the very base where there is sometimes a small stain of colour ; the inner tepals, however, are prominently dark-coloured and glistening at the base, the centre of the dark area being occupied by a short channel on either side of which are low unequal flabellately arranged ridges of tissue (fig. 1, B, F, I). Clearly *Nomocharis* is quite distinct from *Lilium* in its nectarial arrangements, and these may be regarded as valuable generic characters.

(4) STAMENS. In both *Lilium* and *Nomocharis* the anthers are dorsifixed, and though often held erect, at least for a time, they are, in fact, truly versatile. In *Nomocharis* the anthers are generally small, but they are no smaller than those of some *Lilium* species, e.g. *L. grayi* and *L. parvum*. The filaments in the two genera are, however, markedly dissimilar, for whereas in *Lilium* they are slender and taper gradually from base to apex, in *Nomocharis* the filament consists of a fleshy cylindrical or turbinate body with a needle-like awn at the top, the anther being borne on the end of this awn (fig. 1, C, G). Here again is a good generic character.

(5) GYNOECIUM. The only difference in the gynoecia of the two genera is that, whereas in the majority of *Lilium* species the style greatly exceeds the ovary, in *Nomocharis* the style is subequal to the ovary. This difference does not hold good when all the species of *Lilium* are considered. Thus the style is from twice the length of the ovary to subequal to it in

L. bakerianum ; the style is only a little longer than the ovary in *L. pyrenaicum*, *L. hansonii*, *L. chalcedonicum*, and *L. pomponium* ; the style is subequal to or a little longer than the ovary in *L. pumilum*, *L. bolanderi*, and *L. carniolicum* ; the style is shorter than the ovary in *L. callosum*, *L. kelloggi*, and *L. stewartianum*, while in *L. concolor* it is much shorter. Clearly style-length is not a good generic character so far as *Lilium* and *Nomocharis* are concerned. It may be noted that in general the length of the style depends on the shape and size of the perigone. Normally the style is no longer than is necessary to carry the stigma to the mouth of the perigone or just beyond, though, of course, the spreading or recurving of the tepals may cause it to be well-exserted, markedly so when the tepals are revolute.

(6) CONCLUSIONS. As a result of this survey of possible generic characters, it appears that *Nomocharis* sens. str. is distinguished from *Lilium* by the following features :

(i) the open form of the perigone with its tepals spreading widely from the base to give a flat or saucer-shaped flower,

(ii) the inner tepals dark-coloured at the base and there with a series of low ridges of tissue flabellately arranged on either side of a short median channel ; the outer tepals flat at the base, not channelled nor saccate, and apparently not nectarial,

(iii) the filaments consisting of a fleshy cylindrical or turbinate body with a needle-like awn at the top.

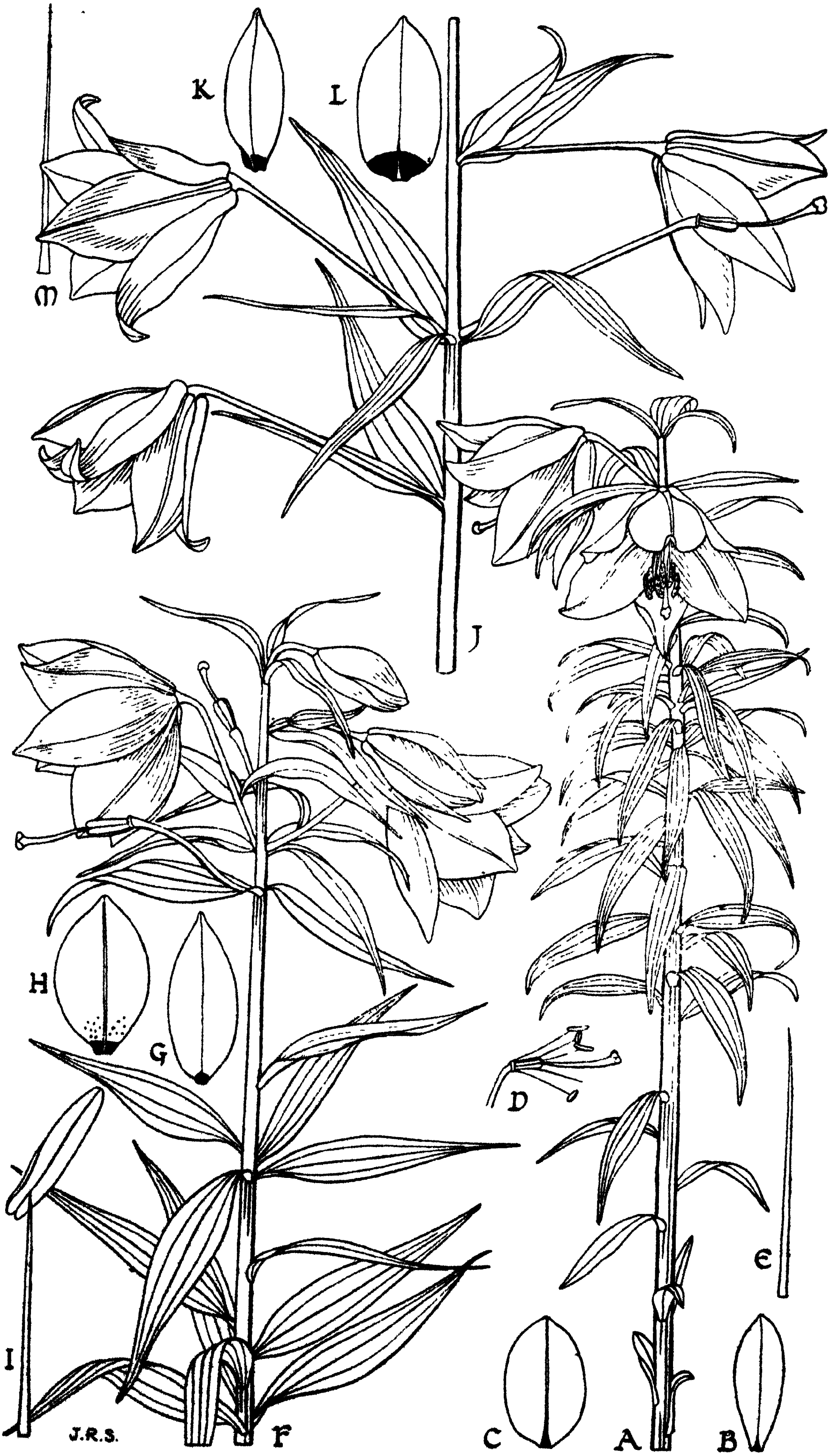
Position of the Doubtful Species.

It is now possible to consider the species which, as mentioned earlier, seem to form a series connecting *Lilium* and *Nomocharis*, and whose inclusion in the latter genus was largely responsible for obscuring its distinguishing characters. The species, to which I have added two other related species, one recently described and another described further on in this article, are the following.

Nomocharis synaptica Sealy.

A new species described below (p. 296, fig. 1, H-K) which is a typical *Nomocharis* in every respect except the stamens. These have filaments which appear, in the dried state, to be subulate, but which upon closer examination are found to be fairly stout, somewhat flattened, dark purplish, and tapered gradually from the base to within 2 mm. of the apex, and there contracted to a fine needle-point which is pale ochre in colour. On all other characters the species must obviously be referred to *Nomocharis*, and the distinguishing characters of that genus have to be emended to include the slender type of filament, which, so far as is known, is not found in *Lilium*. It can be regarded as an intermediate state

FIG. 2. **A–E,** *Lilium mackliniae*, **A** plant, × ⅓, **B** outer tepal, × ½, **C,** inner tepal, × ⅓, **D** gynoecium and androecium (one stamen removed), × ½, **E** filament, × 2. **F–I,** *Lilium henrici* var. *maculatum*, **F** upper part of plant, × ½, **G** outer tepal, × ½, **H** inner tepal, × ⅓, **I** stamen, × 2. **J–M,** *Lilium henrici* var. *typicum*, **J** part of inflorescence, × ⅓, **K** outer tepal, × ½, **L** inner tepal, × ⅓, **M** filament × 2.
A after Bot. Mag. N. Ser. t. 108 ; the remainder drawn from herbarium specimens.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between the subulate filaments of *Lilium* and the fleshy awn-topped filaments of *Nomocharis* sens. str.

Nomocharis aperta (Franchet) E. H. Wilson

This has the typical flat *Nomocharis* perigone with the outer tepals flat, not channelled and not nectarial, at the base, and with the inner tepals dark-coloured, shortly channelled, and nectariferous. But instead of the low ridges typical of *Nomocharis*, the dark-coloured area in *N. aperta* is occupied by two lobulate fleshy swellings, one on either side of the channel (fig. 1, O). There is nothing like this in *Lilium*, but there is no difficulty in regarding it as comparable with the condition in *Nomocharis*, the basal swellings being looked on as equivalent to the ridges of that genus. The filaments in *N. aperta* are like those of *N. synaptica*, so that in this character too the species agrees better with *Nomocharis*. It will be noticed that *N. aperta* is linked to *Nomocharis* sens. str. by *N. synaptica* which agrees with the former in the stamens and the latter in the base of the inner tepals. *N. aperta* is well-illustrated in Bot. Mag. t. 9533 (1938).

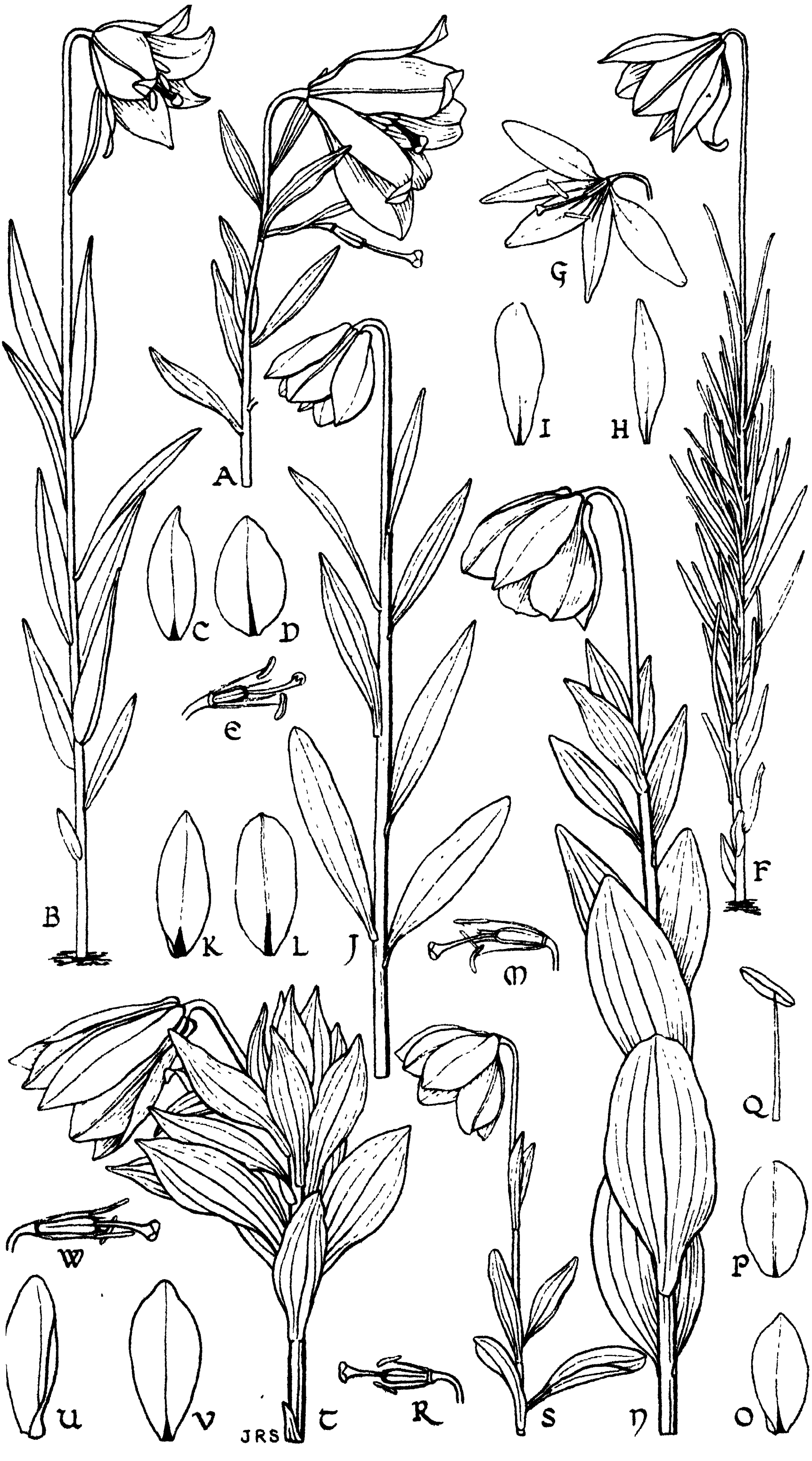
Nomocharis saluenensis Balf. f.

The perigone in this species is usually wide-spreading and saucer-shaped or even flat, as in *Nomocharis*, but sometimes the flowers are distinctly cupular (fig. 1, L) and thus show an approach to *Lilium*. As in *Nomocharis*, the outer tepals are flat at the base and not nectarial, while the inner are dark-coloured, channelled, and nectariferous. The latter, however, resemble *N. aperta* in having a swelling, instead of a series of ridges, on either side of the channel at the base, but whereas in *N. aperta* the swellings occupy the whole of the dark-coloured area, in *N. saluenensis* they form low rounded transverse rims at the top of the dark area, and below them the tepal is slightly concave (fig. 1, M). This is clearly a modification of the condition in *N. aperta*, and is quite unlike anything in *Lilium*. The filaments in *N. saluenensis* (fig. 1, N) are like those of *N. synaptica* and *N. aperta*. The latter is, in fact, the nearest affinity for *N. saluenensis*, and both have to be referred to *Nomocharis*.

Lilium macklimae Sealy

The perigone is cupular to campanulate (fig. 2, A ; see also Journ. R.H.S. **74,** fig. 116–118 : 1949) and very similar to that of *Lilium amoenum* (fig. 3, B) in shape. The outer tepals are noticeably saccate at the base (recalling in this respect *Lilium ochraceum* etc.) and have a short nectarial area, while the inner tepals have a short nectarial groove ; in white flowers these nectarial areas are green and greatly resemble those of *L. amoenium* and *L. candidum* ; in rose-flushed flowers the base of the outer tepals is deeply red-stained. The filaments are subulate and

FIG. 3. **A,** *Lilium bakerianum* var. *yunnanense*, upper part of plant. **B–E,** *Lilium amoenum*, **B** plant, **C** outer tepal, **D** inner tepal, **E** gynoecium and four stamens. **F–I** *Lilium sempervivoideum*, **F** plant, **G** flower spread out (one outer tepal and two stamens removed), **H** outer tepal, **I** inner tepal. **J–S,** *Lilium souliei* ; **J–M** *Soulie* 1029, **J** plant, **K** outer tepal, **L** inner tepal, **M** gynoecium and four stamens ; **N–R,** *Rock* 23167, **N** plant, **O** outer tepal, **P** inner tepal, **Q** stamen, **R** gynoecium and two stamens ; **S,** *Forrest* 14178, plant. **T–W,** *Lilium georgei*, **T** plant, **U** outer tepal, **V** inner tepal, **W** gynoecium and four stamens ; **Q** × 155, the rest one-half natural size.
B–E after Bot. Mag. N. Ser. t. 73 ; the remaining figures drawn from herbarium specimens.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slender (fig. 2, D, E). In all these, generic, features *L.mackliniae* agrees with *Lilium* and is far removed from *Nomocharis* (even as emended by the inclusion of *N. aperta* and *N. saluenensis*) and to the former genus it was, and is, referred without hesitation. It is included here because of its relationship to the next species, *L. henrici*, which was included in *Nomocharis* in Mr. Evans' revision of that genus. An account of *L. mackliniae* has appeared in the Botanical Magazine, N. Ser. t. 108.

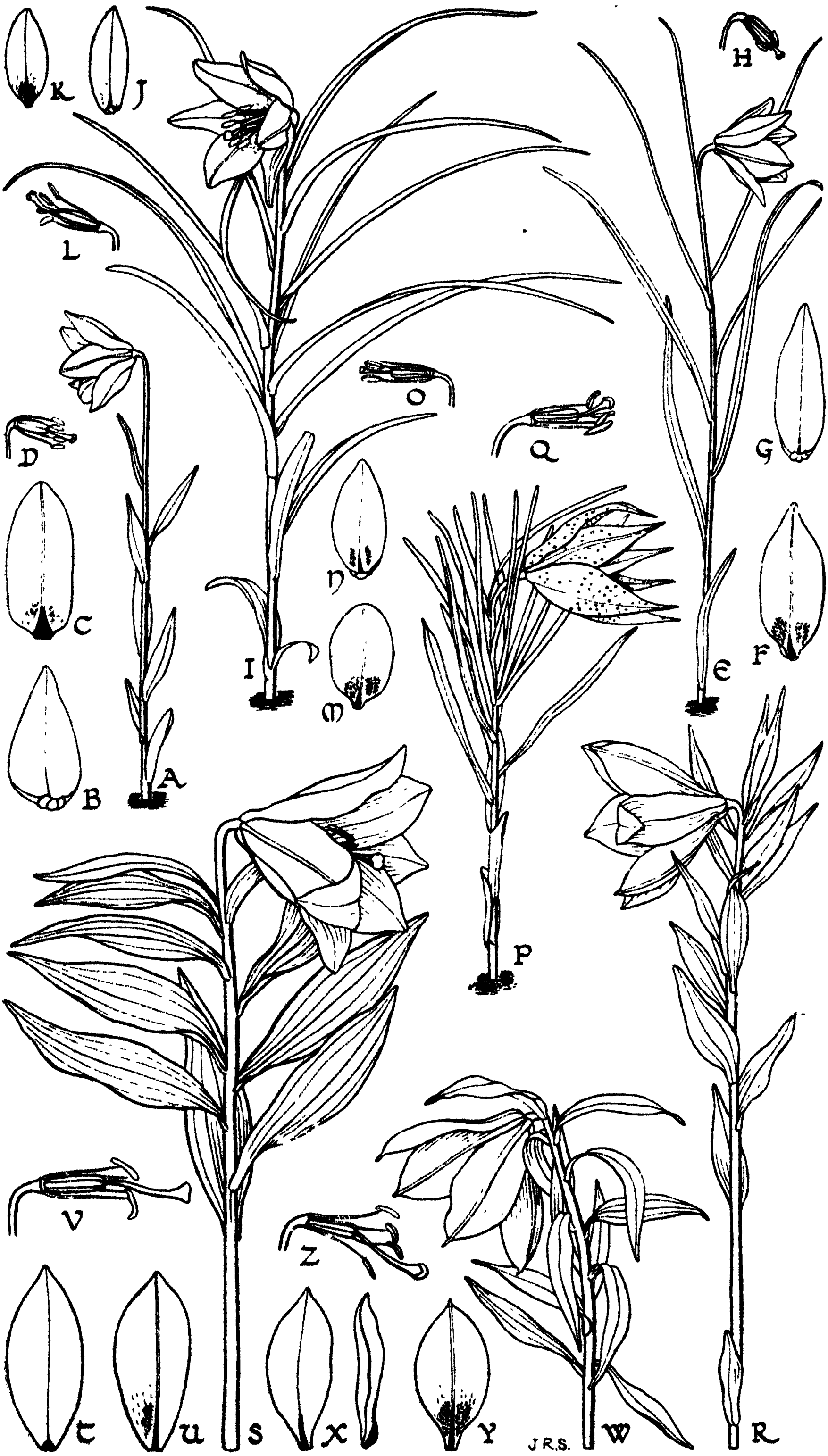
Lilium henrici Franchet

Of this species there are two varieties (see below, p. 289), var. *maculatum* and var. *typicum*. In var. *maculatum* (fig. 2, F-I) the flowers seem to be cupular or deep cupular and thus similar in shape to those of *Lilium mackliniae* and *L. amoenum*. The outer tepals are curved or slightly saccate, not channelled, and have a small deep red stain at the base inside (fig. 2, G), thus agreeing with species of *Nomocharis*. The inner tepals also agree with *Nomocharis* in coloration, inasmuch as they are deep red at the base with red spots just beyond the blotch (fig. 2, H) ; they are sulcate but lack the ridges or swellings characteristic of *Nomocharis*. The filaments are slender and subulate with a barely perceptable contraction to the needle point (fig. 2, I). In the characters which have been accepted as generic, namely shape of perigone, nectaries, and stamens, the plants agree better with *Lilium*, and are obviously more closely related to *L. mackliniae* than to any species of *Nomocharis*.

L. henrici var. *typicum* (fig. 2, J-M) has a deeply cupular or funnel-shaped perigone, which, like the slender subulate filaments, is wholly in keeping with *Lilium*. The inner tepals are sulcate at the base inside and also prominently stained with deep red, but there are no spots and no ridges or swellings. The outer tepals are quite different, being very strongly saccate to gibbous at the base with the pouch deep red coloured, a condition not paralleled in either *Nomocharis* or *Lilium*, the nearest approach to it being the, saccate condition found in some *Lilium* species, notably *L. mackliniae*, where also the base is red-stained. The gibbous base recalls *Fritillaria*, many species of which have the tepals pouched at the base, but in *Fritillaria* all six tepals are pouched, not the three outer as in *L. henrici*, while in all other important characters, bulb, stigma, etc., the latter is completely different from *Fritillaria*.

It is possible that the two varieties of *L. henrici* may represent distinct species, but they agree in so many respects that, for the present at least, it seems advisable to regard them as conspecific. *L. henrici* is therefore accepted as a variable species, in which the perigone ranges from cupular to funnel-shaped, and the outer tepals from scarcely, if at all, saccate to

FIG. 4. **A–D,** *Lilium euxanthum*, **A** plant, **B** outer tepal, **C** inner tepal, **D** gynoecium and four stamens. **E–O,** *Lilium nanum* ; **E–H** *Duthie* 173, **E** plant, **F** inner tepal, **G** outer tepal, **H** gynoecium and four stamens ; **I,** cultivated plant ; **J–L** *Dr. King's Collector*, **J** outer tepal, **K** inner tepal, **L** gynoecium and four stamens ; **M–O** *Norton* 183, **M** inner tepal, **N** outer tepal, **O** gynoecium and three stamens. **P–Q,** *Lilium lophophorum* subsp. *linearifolium*, **P** plant, **Q** gynoecium and four stamens. **R–Z** *Lilium oxypetalum* ; **R,** plant of *Duthie* 182 ; **S–V,** *Duthie* 6039, **S** plant, **T** outer tepal, **U** inner tepal, **V** gynoecium and four stamens ; **W–Z** from a cultivated plant, **W** upper part of plant, **X** outer tepal inner surface and side view, **Y** inner tepal, **Z** gynoecium and four stamens. **C, B, F, G,** natural size ; remainder one-half natural size.
I after a painting by Stella Ross-Craig, **W–Z** from a living specimen, remaining figures drawn from herbarium specimens.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gibbous. It is clearly to be referred to *Lilium* rather than *Nomocharis*, and its inclusion in that already heterogeneous genus will mean that *Lilium* incorporates plants with the outer tepals gibbous at the base as well as those with outer tepals slightly to strongly saccate.

Nomocharis souliei (Franchet) W. W. Sm. & W. E. Evans

Originally described as a *Fritillaria*, this dwarf species (fig. 3, J-S) much resembles certain species of that genus in being one-flowered with the flowers nodding and campanulate, deep brownish-crimson in colour, and in having the outer tepals markedly gibbous at the base. The inner tepals, however, are sulcate at the base and have no other ornament, while the bulb and stigma agree with those of *Lilium* and *Nomocharis* and not with those of *Fritillaria*. In all generic characters the plant is widely different from *Nomocharis*, but there seems no reason why it should not be included in *Lilium*, if, as proposed above, the limits of that genus be widened to include *L. henrici*, in which the outer tepals are also gibbous at the base. Apart from the flower-colour, there is more than a passing resemblance between plants of *N. souliei* and such lilies as *L. bakeriauum* var. *yunnanense*, *L. amoenum*, and *L. sempervivoideum*, as will be evident from fig. 3.

Nomocharis georgei W. E. Evans

A most distinctive species (fig. 3, T-W) allied to *N. souliei*, with which it agrees in being dwarf and one-flowered, in the perigone being campanulate, in the outer tepals strongly gibbous at the base, the inner tepals simply sulcate, and the filaments subulate. The flower-colour, rich soft blue-purple deepest on the outside according to the collector, is unique, while the crowded leaves further distinguish it from *N. souliei* as will be seen from fig. 3. The two species are, however, congeneric, and if *N. souliei* is transferred to *Lilium*, *N. georgei* must also be placed in that genus.

Nomocharis section *Oxypetala* Balf. f.

The section comprises four species which agree so well in technical characters that they can be considered together. Three of the species, *N. nana* (Klotzsch) E. H. Wilson (fig. 4, E-O), *N. oxypetala* (Royle) E. H. Wilson (fig. 4, R-Z) and *N. lophophora* (Bur. & Franch.) W. E. Evans (fig. 4, P, Q; fig. 5), are very variable and have been referred to both *Lilium* and *Fritillaria*, while the fourth species, *N. euxantha* W. W. Sm. & W. E. Evans (fig. 4, A-D), is a more recent discovery known only from the material collected by Forrest and Farrer. All are dwarf one-flowered plants with horizontal or nodding funnel-shaped or cupular flowers, which for the most part agree in shape with *Lilium*. In the figure of *N. nana* in the Botanical Magazine (t. 4731, reproduced in Elwes, Monogr. Lil. t. 5), however, the perigone is shown wide-spread as in *Nomocharis*, but in the few living plants I have seen the perigone was decidedly funnel-shaped or cupular, while the dried specimens of wild plants give the impression that the flowers were from cupular to widely and shallowly funnel-shaped, and do not suggest that the perigone was ever so widely open as shown in the figure. Incidentally the flowers shown in the plates mentioned above are one-and-a-half times the size of those in the original drawing. All four species of sect. *Oxypetala* have yellow flowers, while *N. nana* and *N. lophophora* also include plants with purplish flowers ; the flowers may be unspotted, or finely spotted towards the base, or more heavily spotted throughout. The principal characteristic of the section, however, is that the inner tepals have, inside at the base, one or more lacinate pale crests on either side of a short nectarial groove, which seems generally to be green or greenish (fig. 4, F, M, Y). The crests are not invariably present and are sometimes weakly developed or restricted to one side of the groove (fig. 4, U) ; in *N. euxantha* they are commonly weakly developed (fig. 4, C) and may be completely absent (var. *imberbis*), as is also the case in some specimens of *N. nana*. The outer tepals generally lack the crests (fig. 4, B, G, T, X), but they are sometimes present, usually weakly developed (fig. 4, N) ; these tepals are, however, always clearly saccate at the base and usually also shortly grooved, the sac and groove being nectarial. The outer tepals are thus very different from those of *Nomocharis*, but resemble those of some lilies, e.g. *L. mackliniae* and *L. henrici*, while the presence of a few outgrowths—the weak beginnings of crests—found in some outer tepals recalls the condition found sometimes in *Lilium*. As to the inner tepals, they could be compared with the inner tepals of *Nomocharis* if the crests are regarded as being similar to the low ridges of that genus, though the tepals are not dark-coloured at the base as is usual in that genus ; or they can be compared with the inner tepals of *Lilium*, the crests being regarded as similar to the outgrowths found in that genus, and as being especially comparable with the condition found in forms of *L. bulbiferum*, where, as already mentioned, the outgrowths sometimes form interrupted crests. In those inner tepals where the crests are much reduced, e.g. *N. euxantha*, the condition is particularly reminiscent of that in *Lilium* species, and it may be noted that the crests in sect. *Oxypetala*, like the outgrowths in *Lilium*, arise from the nerves of the tepal. Finally, the filaments in sect. *Oxypetala* are subulate as in *Lilium*.

To sum up, the species of sect. *Oxypetala* differ so markedly from *Nomocharis* in the form of the perigone, outer tepals and stamens, that their retention in that genus is not justified. On the other hand, they agree with *Lilium* in these features, and since the cristate inner tepals are not incompatible with that genus, there is no reason why the species of sect. *Oxypetala* should not be included in *Lilium* pending further investigation of the limits of that genus. It is possible that the species of sect. *Oxypetala*, perhaps with the addition of *L. souliei* and *L. georgei*, may have to be given the rank of a distinct genus, but this is a question that cannot be decided until the whole of *Lilium* sensu latiore has been subjected to a critical taxonomic investigation.

Conclusions.

If the species dealt with above are left on one side, *Nomocharis* is a small, homogeneous, very natural genus, differing markedly from the large, heterogeneous *Lilium* in its wide open perigone, outer tepals not channelled or nectarial, inner tepals dark-coloured at the base and so forming a prominent " eye " in the centre of the flower, the dark area occupied by low ridges of tissue flabellately arranged on either wide of a short median channel, and in its filaments being fleshy and cylindrical or turbinate with an awn at the top. Of the species whose position is more or less doubtful, *N. synaptica*, *N. aperta*, and *N. saluenensis* can be accommodated in *Nomocharis* without spoiling its essential characters. The inclusion of the remaining species in that genus would, and did, destroy its distinctiveness, and would leave no characters by which it could be differentiated from *Lilium*. On the other hand, there seems no reason why these species should not be placed in *Lilium*. *N. souliei*, *N. georgei* and the species of *Nomocharis* sect. *Oxypetala* all have much in common; they all differ greatly from *Nomocharis* in perigone-shape, in nectaries of the outer tepals, and in the stamens, but agree in these characters with *Lilium*, so that there can be no doubt that they would be better placed in the latter genus. Finally there is *N. henrici*, whose var. *maculata* might conceivably be included in *Nomocharis* as an aberrant form (i.e. having a cupular, not wide-open perigone, lacking the ridges or swellings on the inner tepals, and having subulate, not fleshy, filaments), but whose var. *typica* so evidently resembles *N. souliei* and its allies in the pouched nectaries of the outer tepals, and whose nearest ally seems to be *Lilium mackliniae*, so that when the species is considered as a whole it must evidently be referred to *Lilium*. It is therefore proposed that *Nomocharis* should be restricted to the species of sect. *Eunomocharis* and the three other species mentioned above, and that the remainder of the species currently included in *Nomocharis* should be transferred to *Lilium*. Such nomenclatural changes as are necessary are made below, where observations on certain species are also given.

Lilium bakerianum

A very variable and wide-spread species, distributed—albeit discontinuously—from the Southern Shan States eastwards to Kweichow, and—more continuously—north-eastwards through the high mountains of north-west Yunnan to southern Szechuan and western Sikang. Four described species are included in the synonymy, namely *L. lowii* Baker, *L. delavayi* Franchet, *L. yunnanense* Franchet, and *L. linceorum* Lévl. & Van. The second of these was recognized as a distinct variety by E. H. Wilson in 1925, but the fact that the last two represented equally distinct entities was inexplicably overlooked by him and by all subsequent writers. It was therefore something of a surprise to find, when sorting the specimens in the Kew Herbarium, that the material from eastern Yunnan and Kweichow formed a natural group characterised by short narrow leaves and rose-coloured flowers, and that certain specimens from north-west Yunnan which had immaculate or very finely spotted white flowers were also alike in other respects, namely short stature and short relatively broad leaves. This material is the *L. yunnanense*, while the east Yunnan-Kweichow specimens are the *L. linceorum*.

L. bakerianum, in the broad sense, consists, in fact, of five varieties, recognised easily by flower-colour, but having vegetative characteristics as well, and occupying well-defined homogeneous areas of distribution, as set out below.

Lilium bakerianum *Collett & Hemsley* in Journ. Linn. Soc. London, Bot. **28,** 138 (1890) var. **typicum** Stearn in Gard. Chron. ser. 3, **124,** 4 (1948); 60–120 cm. altum foliis 5–7·5 cm. longis et 3–5 mm. latis (interdum 7–12 mm. latis), sed plantae debilia 27–30 cm. altae foliis 3–3·7 cm. longis et 3–5 mm. latis, floribus 1–4; perigonium 6·5–11 mm.

(in hortis usque ad 13 cm.) longum, album intus a basi purpureo suffusum et supra maculatum vel omnino plus minus intense purpureo-maculatum. Syn. *L. lowii* Baker in Bot. Mag. t. 7232 (1892).

SOUTHERN SHAN STATES : Taunggyi (20° 48′ N., 97° E.), *W. A. Robertson* 339 ; prope Koni (circiter 30 km. SW. Taunggyi), *H. Collett* 834 (typus).

CHINA—S. YUNNAN : Szemao, *A. Henry* 13026 ; Mengtze, *W. Hancock* 214.

A tall plant with relatively long narrow leaves, and perigone exceeding that of the other varieties in size. It differs from other members of the species in its white flowers either heavily suffused with purple or maroon in the lower part and blotched upwards or more or less heavily blotched throughout. The type-locality is the most southerly record for the species and is remote from the other two stations for var. *typicum.* The variety is in the subtropical or warm temperate zone in latitudes 20° 48′–23° 20′ N., and is isolated from all the other varieties except var. *rubrum,* whose range it overlaps at Mengtze.

L. bakerianum var. **rubrum** *Stearn,* l.c. ; 20–60 cm. rare ad 80 cm. altum foliis 2·5–6 cm. longis plerumque 2–5 mm. interdum ad 7 mm. latis, floribus plerumque 1 interdum 2 vel in plantis robustissimis 3–4 ; perigonium 5–8 cm. longum, roseum vel obscure purpureum, intus fusco-purpureo maculatum et suffusum.

Syn. *L. linceorum* Léveillé et Vaniot in Mem. Pont. Accad. Rom. Nuov. Lincei, **23,** 371, t. 2 (1905), reimpr. Lil. Amaryll. Irid. Hemod. Chine, 43, t. 2 (1905).

CHINA—E. YUNNAN : Peta, route de Tchen fong—Shiu guj fou, *Esquirol* 3135 ; Pe-long-tsin, *Maire* ; Siao-ou-long, *Maire* ; Lan-ngi-tsin, *Maire* ; ibid. *Ducloux* 2665 ; Tong-tchouan [Tungchwan], *Maire* (Juin et Juillet) ; ibid. (" Tchong-Chan ") *Ducloux* 437 ; mountains N. of Yunnanfu, *Schoch* 214 ; Yunnanfu area, *Ducloux* 479, *Maire* 2239, 2654, *Maire anno* 1912 ; Mengtze, *Hancock* 309, 568 ; ibid. *A. Henry* 10774, 10774A, 10774B ; Lao-kouy-chan, *Vigueou* 430 ; Beling chan, *Handel-Mazzetti* 10148.

KWEICHOW : Ganpin, *Martin & Bodinier* 1681 ; Gan-chouan, *Cavalarie* 3925.

Recognised from all the other varieties by the ground-colour of the flowers being pink or rose. It also has a distinct geographical distribution, being confined to eastern Yunnan and Kweichow, though, as noted above, var. *typicum* has also been found at Mengtze. Commonly a single-flowered plant less than 60 cm. high with rather short narrow leaves, it is generally shorter and has shorter leaves than var. *typicum.* It is comparable in size with var. *yunnanense,* but the leaves are generally narrower.

Lilium bakerianum var. **delavayi** (*Franchet*) *E. H. Wilson,* Lilies of Eastern Asia, 43 (1925) ; 45–150 cm. altum, foliis 2·5–3·5 cm. longis et 2–8 mm. latis usque ad 5–7·5–(8) cm. longis et 5–9–(12) mm. latis, floribus 1–2 raro 3–4 ; perigonium 6·5–8 cm. longum (rarissime usque

9 cm. longum ut in *Forrest* 5824 in herbario Edinensi), viridi-luteum plus minus intense purpureo-maculatum vel purpureo-rubro inferne suffusum et superne maculatum.

Syn. *L. delavayi* Franchet in Journ. de Bot. **6**, 314 (1892).

China—N.W. Yunnan : W. of Tengyueh, 25°N., *Forrest* 8499 ; Shweli-Salwin divide, 25° 45′ N., *Forrest* 25105 ; eastern flank of the Tali range, 25° 40′ N., *Forrest* 1894, 7137, 27994 ; Tali, *Forrest* 30141 ; above Lan Kong lake, *Delavay* 4310 ; [Kou-toui, *Delavay* ; Yang in chan, *Delavay* 4309 ; Houang-li-pin above Tapintze, *Delavay* 3576 ;—all *fide* Franchet, l.c. The localities are in the mountains north of the Tali Lake (Erh Hai) about 26° 8′ N., from Lankong in the west to Tapintze in the east.] ; Lao-chun shan, S.W. of Shiku, 26° 40′ N., *Rock* 25127, 25129 ; Yun-lu shan, *Rock* 25048 ; N. of Yungpeh, *Forrest* 22061 ; Lichiang mountains, 26° 50′–27° 35′ N., *Forrest* 2433, 5824, 10317, 30174, 30177, *Rock* 4756, 7402, 24934, 24935, *Schneider* 1840 ; ibidem ? –Chuisa shan, *Forrest* 30166, 30167 ; Labo shan, *Forrest* 30181 ; sine loc. *Forrest* 28581, 28747 ; sine loc. *McLaren's Collectors* B. 137, B. 138, L. 64, N. 91 ; Yungning, *McLaren's Collector* N. 20 ; ibidem (" Yungling "), *Forrest* 30160 ; Mt. Wuaha, Yungning Territory, *Rock* 24230, 24232.

S.W. Szechuan : S.E. of Yungning, 27° 40′ N., *Forrest* 21448 ; descent to Shiu lu, *F. K. Ward* 4245 ; watershed of Shou-chu river, *Rock* 16268 ; between Yenyuan hsien and Kuapie, *Schneider* 1485.

A variable plant characterised by the flowers having a greenish-yellow ground colour heavily blotched with purplish-red, or the purplish colour suffusing the lower part of the perigone. Geographically it is completely set apart from var. *typicum* and var. *rubrum*.

Lilium bakerianum var. **aureum** *Grove & Cotton* in R.H.S. Lily Year Book, **8**, 127 (1939) et Suppl. Elwes' Monogr. Gen. Lilium, 114–5, t. 26 (1940) ; 45–100 cm. altum, foliis 6·5–11 cm. longis et 6–11 mm. latis, floribus 1–3 ; perigonium (5)–6·5–8 cm. longum, intense aureum (secundum Forrestium) vel viridi-flavum, delicate brunneo-purpureo-maculatum.

China—N.W. Yunnan : mountains between the Yangtze and Mekong rivers, west of Chienchuan, 99° 20′–99° 42′ E. and about 26° 30′–26° 40′ N., *Forrest* 21578, 22210, 23548 ; " Lao Ching Shan " [? Lao Chun Shan, 26° 40′ N.], *Forrest* 30172 (?).

Characterised by its long, relatively wide leaves, and yellow finely spotted flowers. In both characters it contrasts with the other yellow-flowered variety, var. *delavayi*. Its localities are within the range of var. *delavayi*, but the specimens are easily distinguished.

Lilium bakerianum var. **yunnanense** (*Franchet*) *Sealy*, **var. nov.** ; 18–50 cm. altum, foliis 2·5–4·5 cm. longis et 7–13 mm. latis usque ad 3–5·5 cm. longis et 4–6 mm. latis, floribus 1–2 [in una planta (*Forrest* 16934) caulis 3-floris] ; perigonium 4–8 cm. longum, album vel extus pallidissime roseo suffusum, immaculatum vel intus a basi per duas tertias partes delicate purpureo-maculatum.

Syn. *L. yunnanense* Franchet in Journ. de Bot. **6**, 314 (1892).

CHINA—N.W. YUNNAN : around Tapintze, *Delavay* 1837, 2737, 3577 ; western slopes of Sungkwei Range, 100° 12′ E., 26° 18′ N., *Forrest* 23052 ; near Yungpeh, *Handel-Mazzetti* 3381 ; ibidem, *Siméon Tén* 276 ; mountains N. of Yungpeh, 26° 50′ N., *Forrest* 22087 ; between Likiang, Yungning, and Yungpeh, *Rock* 5181 ; mountains in the N.E. of the Yangtze bend, 27° 40′ N., *Forrest* 10545 ; ibidem, 27° 45′ N., *Forrest* 11325 ; Fengkow, *Forrest* 30180 ; Yangtze valley N. of Fengkow, 27° 42′ N., *Forrest* 20666 ; Yangtze gorge (apex of loop), *F. K. Ward* 5281 ; gorge of the Shiu-lu, *F. K. Ward* 4294 ; Kari pass, Mekong-Yangtze divide, 27° 40′ N., *Forrest* 12977 ; sine loc. *McLaren's Collector* B. 167.

This is a relatively dwarf plant, resembling in this respect var. *rubrum*, with short and relatively broad leaves. It is also characterised by its flowers being pure white, or faintly flushed with rose outside, immaculate or finely spotted. The white-flowered var. *typicum* has the flowers heavily blotched and is a much bigger plant in every way. The finely spotted var. *aureum* not only differs by its yellow ground colour but also by its greater size.

A much taller plant has been collected further north in Sikang, on Dzampe Sheren Mt. west of Wuato Gomba by Rock (23756) and near Tachienlu by Wilson (*Veitch Exped.* 4692, *Arn. Arb. Exped.* 1450). This has stems from 65 cm. long with leaves 3–3·5 cm. long and 3–4 mm. wide, to over 125 cm. long with leaves 6–8 cm. long and 3–5 mm. wide. The flowers, 2 in number and about 7 cm. long in all the specimens seen, are white (*Rock* 23756) or white finely spotted with maroon (?), though the spots are larger and heavier in the Kew sheet of Wilson's 1450 than in the Edinburgh sheet of the same number. These specimens stand between var. *yunnanense*, with which they agree in the flowers, and var. *typicum*, which they much resemble in stature and size of leaves. Geographically they are near to the former, though located farther north, but very remote from the latter.

Lilium euxanthum (*W. W. Sm. & W. E. Evans*) *Sealy*, **comb. nov.**
Syn. *Nomocharis euxantha* W. W. Sm. & W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15,** 14–16 (1925) 192 (1926).

Lilium georgei (*W. E. Evans*) *Sealy*, **comb. nov.**
Syn. *Nomocharis georgei* W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15,** 193–4, t. 218 (1926).

Lilium henrici.
When dealing with this species—which he included in *Nomocharis*—Mr. W. E. Evans pointed out that the material referred to it could be divided into two groups, which he designated as f. *typica* and f. *maculata* (Notes Roy. Bot. Gard. Edinb. **15,** 194–5 : 1926). The f. *typica* was characterised by the perigone being white or very faintly flushed with pink, by the outer tepals deeply saccate or gibbous at the base, and by the inner tepals with a broad deep crimson blotch covering the base ; while f. *maculata* differed in having the perigone more or less deeply flushed with rose-purple, in the outer tepals being curved or only very slightly saccate at the base, and in the inner tepals having only a small crimson botch at the base, with a few crimson spots above it.

Examination of the herbarium material reveals other differences, as follows. The bulb is deep purplish in f. *typica*, but smaller and yellow in f. *maculata* ; the plants are bigger in f. *typica* (stem 75–182 cm. long against 30-67 cm.) and have the flowers much more laxly arranged, being distributed through 10–19 cm. of stem (against crowded in up to 6·5 cm. of stem in f. *maculata*), and borne on longer pedicels (3·5–8·5 cm. long against 1·5–4 cm.) ; while finally the styles in f. *typica* are 2·5–3 cm. long against 1·7–2·1 cm. in f. *maculata*. It must be noted that in his field-notes Forrest recorded f. *maculata* as up to 2½–3 ft., i.e. 75–90 cm., but no material of these dimensions has been seen—the largest example having stems 67 cm. in length (from top of the bulb). It is possible that f. *maculata* may represent a distinct species, but until more is known about it, it may well remain in *L. henrici*, though varietal rank seems more appropriate than that of a form. Details of the two varieties of *L. henrici* are given below.

L. henrici *Franchet* in Journ. de Bot. **12,** 220 (1898) var. **typicum** (*Evans*) *W. T. Stearn* in Woodcock & Stearn, Lilies of the World, 226 (1950)*. Bulbi usque 5 cm. alti et 6 cm. diametro, squamis intense purpureis ; caules 75–182 cm. alti (ad apicem bulbi) ; folia in plantis minoribus 5–7·5 cm. longa et 4–7 mm. lata, in plantis majoribus plerumque 9–14 cm. longa et 6–11 mm. lata ; flores in plantis minoribus 2 approximati pedicellis 3-4·5 cm. longis, in plantis majoribus 4–8 valde separati (in caule per 10–19 cm. dispositi) pedicellis horizontalibus 3·5–8·5 cm. longis ; perigonium campanulatum vel cupulare, album vel leviter roseo-tinctum ; tepala exteriora basi valde saccata vel gibbosa et intus macula intense rubra medio viridi-sulcata ornata ; tepala interiora intus basi per 8 mm. valde intense rubra medio viridi-sulcata ; stylus 2·5–3 cm. longus. Fig. 2, J-M.

Syn. *Lilium franchetianum* Léveillé, Liliographia, 7 (1919).)
Nomocharis henrici (Franchet) E. H. Wilson, Lilies E. Asia, 13 (1925) ; W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15,** 38–40, t. 209, 212b (1925), pro parte.
Nomocharis henrici forma *typica* W. E. Evans, l.c. 194–5 (1926).

CHINA. N.W. YUNNAN : gauche du Mekong vers. Lou Kou [Luku], *Henri d'Orleans* (type) ; Mekong-Salwin divide, 26° 10′ N., *Forrest* 18282 ; ibid. 26° 30′ N., *Forrest* 18250 ; Chintsi Shan, west of Wei Hsi, 27° 12′ N., 99° 12′ E., *Forrest* 30158 ; Laktang, *F. Kingdon Ward* 3261 ; sine loc. *McLaren's Collector* D. 188.

L. henrici var. **maculatum** (*Evans*) *W. T. Stearn* l.c. Bulbi 2·5–3·5 cm. alti et 3–4 cm. diametro, squamis flavis ; caules 30–67 cm. longi (ad apicem bulbi) ; folia in plantis minoribus 5–7 cm. longa et 4–8 mm. lata, in plantis majoribus plerumque 6–11 cm. longa et 7–13 mm. interdum usque 16 mm. lata ; flores in plantis minoribus 1–2, in plantis majoribus 2–6, approximati interdum subverticillati (in caule per longitudine

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*After the present account had been prepared, Mr. Stearn told me that he too had come to the conclusion that f. *typica* and f. *maculata* should be given varietal rank, and had made the necessary combinations.

usque 6·5 cm. conferti), pedicellis ascendentibus vel patulis (1·5)–2–4 cm. rarissime 5·5 cm. longis ; perigonium cupulare album plus minus roseo tinctum ; tepala exteriora basi curvata (vix saccata vel canaliculata) intus macula rubra parva ornata ; tepala interiora basi intus leviter sulcata et macula rubra usque 5 mm. alta et maculis minutis paucis rubris ornata ; stylus 1·7–2·1 cm. longus. Fig. 2, F-I.

Syn. *Nomocharis henrici* (Franchet) E. H. Wilson ; W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15,** 38-40 (1925) pro parte.

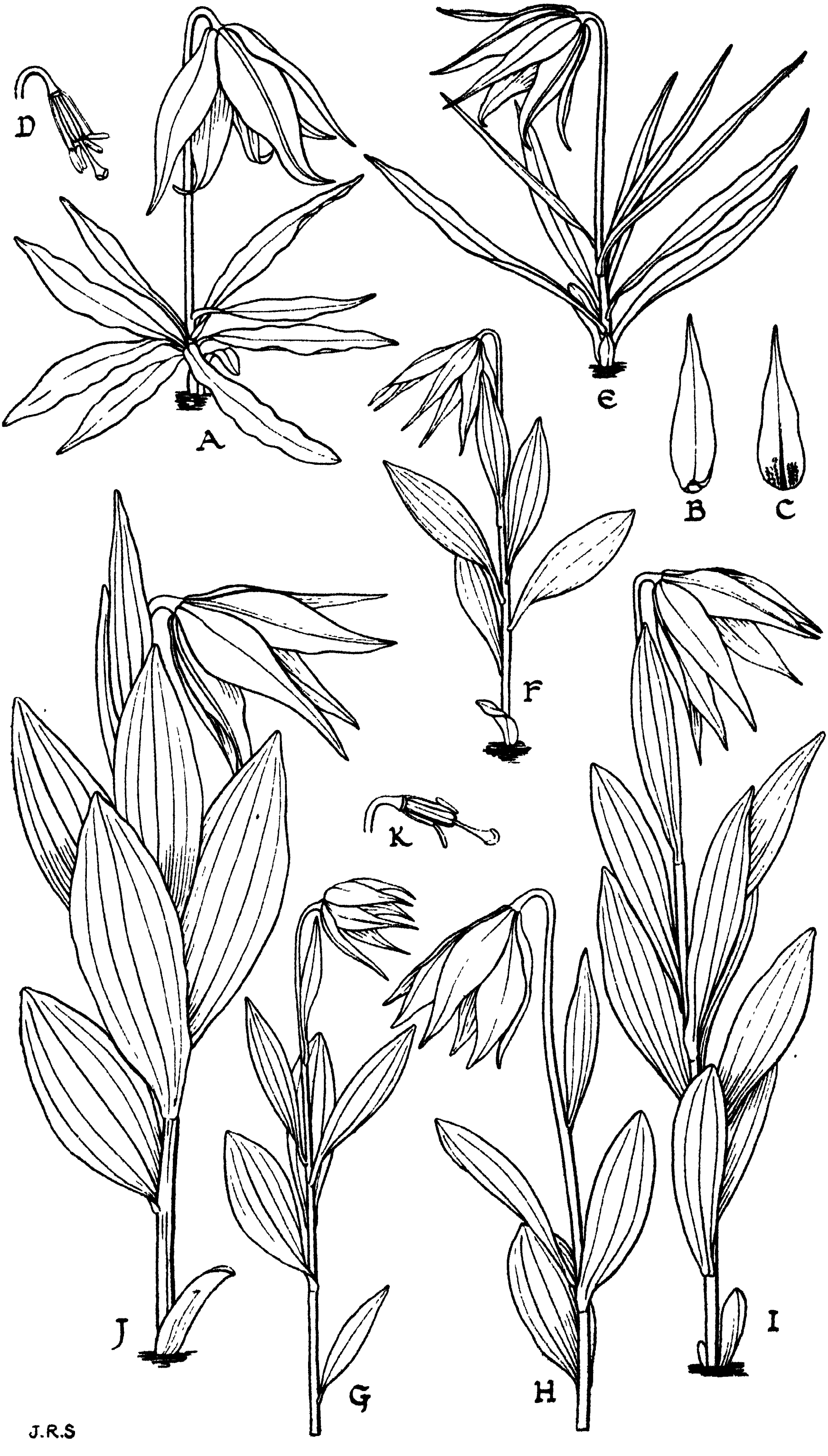
Nomocharis henrici forma *maculata* W. E. Evans in Notes Roy. Bot: Gard. Edinb. **15,** 194-5 (1926).

CHINA—N.W. YUNNAN : Shweli-Salwin divide, 25° 20′ N., *Forrest* 12024, 9024 (?—in fruit), 15827 ; ibid. 25° 25′ N., *Forrest* 17487 ; ibid. 25° 30′ N., *Forrest* 17590 ; ibid. 25° 50′ N., *Forrest* 24788, 26780 ; Mekong-Salwin divide, 26° 30′ N., *Forrest* 18208 ; sine loc. *Forrest* 29942.

Lilium lophophorum.

This charming and graceful species, outstanding on account of its nodding flowers with lanceolate long-acuminate segments (which sometimes remain coherent at the apices so that the flower has the appearance of a small Chinese lantern), is very variable. It was originally described from specimens collected in Sikang, and most of the material from that province and from the adjacent parts of Szechuan and Yunnan holds together very well. The plants (fig. 5, A) are small, about 7–13·5 cm. high above ground, and have 6-9-(10) spreading or ascending leaves crowded and rosulate on the 1-2·5 cm. of the stem immediately above ground, the stem being continued upwards as a naked pedicel 6–12 cm. long bearing a single nodding flower, or, rarely, there may be twin pedicels each carrying a flower ; the leaves are elliptic-oblong, acute, mostly 4-7 cm. long and 4–12 mm. wide, and undulate ; the flowers may be yellow and sparsely finely red-spotted inside (usually in the lowermost third only), or yellow and emaculate, or purplish. An exceptionally robust example is *Pratt* 568 from Tachienlu (figured in Hooker's Icones Plantarum t. 2219) with leaves 8-11·5 cm. long and 1·5-2·3 cm. wide spread over 7 cm. of stem, and with twin pedicels 13 cm. long ; while Soulié's 326 from Tongolo and Wilson's 4689a from Tachienlu include notably etiolated plants with leaves 9–15 cm. long and 7–15 mm. wide, spaced along 10·5–18·5 cm. of stem, and with pedicels about 15 cm. long. Agreeing with typical plants except that the leaves are shorter and broader (3–5 cm. long and 7–15 mm. wide) and tend to be more obtuse, is Forrest's 23074, collected in Yunnan on the Chienchuan-Mekong divide, 26° 36′ N., and the southernmost record for the species.

In certain specimens from N.W. Yunnan (*Kingdon Ward* 157) and S.W. Szechuan (*Rock* 23870, *Schneider* 1512) the leaves tend to be shorter and broader (4-6·5 cm. long and 8–16 mm. wide), apparently more or less erect, and scattered through (3·5)–5–10 cm. of stem ; the pedicel varies from twice as long as to a little shorter than the leafy part of the stem, but in one specimen of K.W. 711 the pedicel is much shorter (4·5 cm. long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against 10 cm. for leafy part) and in one plant of Rock's 23870 it is little more than half as long (3·5 cm. against 6·5 cm.) and the uppermost leaf overtops the flower.

These specimens (see fig. 5, F, G) with short pedicels and broader, more scattered, erect leaves resemble plants from the Lichiang area of N.W. Yunnan which commonly have the leafy part of the stem twice to four times as long as the pedicel, though sometimes subequal to less than twice as long. Moreover the leaves are broader than those of the typical form of the species (5·5–10 cm. long and 8–28 mm. wide against 4–7 cm. by 4–12 mm.), erect or ascending and frequently overtopping the flower ; they occupy from 5 cm. to 17 cm. of stem, while the pedicel ranges from 3 to 8 cm. in length and from a trifle longer than the leafy part (6 cm. against 5·5 cm.) to one quarter as long (3 cm. against 12 cm.). In extreme cases these Lichiang plants appear so different from the typical form of the species that a distinguishing epithet is desirable, and they have been designated below as forma *latifolium* (fig. 5, H-J).

From extreme N.W. Yunnan near the Tibet border, 27° 30′–28° 30′ N. have come plants which resemble typical *L. lophophorum* in having the leaves crowded in a rosette in the basal 1–2 cm. of stem, or spaced over 5 cm. with the pedicel at least twice as long as the leafy part, but which differ in having longer and much narrower leaves, 6–10 cm. long and 2–8 mm. wide (against 4–7 cm. by 4–12 mm.). This is *Nomocharis wardii* of Balfour f. (fig. 5, E). The flowers may be yellow and emaculate, yellow spotted red inside, or purplish—all three being represented in the type-collecting, *Kingdon Ward* 813—and the inner segments are very weakly crested, there being very few fimbriae on either side of the nectarial channel. In two of the localities (Atuntze and Doker-la) where he collected the narrow-leaved plants, Kingdon Ward also found plants with broader, more scattered leaves, which may represent weak examples of f. *latifolium*. The narrow-leaved plants seem best regarded as a form of the species, and may be conveniently named f. *wardii*. Finally there are specimens collected in Yunnan by Forrest (30170) and Rock (25057, 25158) which agree with *L. lophophorum* in shape of flower, but which differ strikingly by the (yellow) flower being conspicuously red-spotted, and by the much narrower, more numerous (15–16 against 4–9), linear leaves, which are 4·5–9·5 cm. long, 5–2 mm. wide, and clothe the stem throughout its length (fig. 4, P, Q). Except for the heavy spotting the flowers agree with those of *L. lophophorum*, and therefore, despite the very great difference in general appearance, it seems better to regard this linear-leaved plant as a subspecies of that species, rather than as a distinct species. A synopsis of the material referred to *L. lophophorum* and its subspecies and forms follows.

FIG. 5. *Lilium lophophorum* subsp. *typicum* ; **A–D,** *Wilson V. E.* 4369, **A** plant, **B** outer tepal, **C** inner tepal, **D** gynoecium and four stamens ; **E** plant of f. *Wardii* (*K. Ward* 813) ; **F–K,** f. *latifolium*, **F** & **G** plants of *K. Ward* 711, **H** *Rock* 24877, **I–K** *Forrest* 2390, **I** & **J** plants, **K** gynoecium and two stamens ; all figures one-half natural size. All drawn from herbarium specimens.

Lilium lophophorum (*Bur. & Fr.*) *Franchet* in Journ. de Bot. **12,** 221 (1898) ; Wilson, Lilies E. Asia, 104 (1925) ; subsp. **typicum** *Sealy*, **subsp. nov.** Fig. 5, A-D.

Syn. *Fritillaria lophophora* Bureau et Franchet in Journ. de Bot. **5,** 153 (1891).

Nomocharis lophophora (Bur. & Fr.) W. E. Evans in Notes Roy. Bot. Gard. Edinb. **15,** 11–14 (1925).

SIKANG : between Batang and Litang, *Bonvalot et d'Orleans* (fide Bureau et Franchet) ; Tachienlu, *Soulié* 989 ; ibidem, *Pratt* 261, 568 ; ibidem, *E. H. Wilson Veitch Exp.* 4689, 4689a, *Arn. Arb. Exp.* 1456 ; Tongolo, *Soulié* 326, 725 ; Baurong to Tachienlu via Hadjaha, *Stevens* 412 ; Muli Mts. 28° 12′ N., *Forrest* 16664 ; Dzampe sheren Mt., west of Wuato Gomba, E. Muli, *Rock* 23743, 24342 ; Litang R. divide, S.W. of Muli, *Kingdon Ward* 4074.

S.W. SZECHUAN : Mt. Siga, N.E. of Kulu, *Rock* 17922, 24377.

N.W. YUNNAN : Mts. of Chungtien Plateau, 27° 55′ N., *Forrest* 10624 ; Chienchuan-Mekong divide, 26° 36′ N., 99° 40′ E., *Forrest* 23074 ; sine loc. *Forrest* 28739.

L. lophophorum subsp. **typicum** forma **latifolium** *Sealy*, **forma nova** foliis in caulem per 5–17 cm. dispersis erecto-ascendentibus 4–10 cm. longis et 8–28 mm. latis, pedicello quam caule foliato plerumque magis breviore sed interdum subaequali raro duplo longiore recognoscenda. Fig. 5, F-K.

S.W. SZECHUAN : Mt. Siga, west and overlooking the Yalung River N. of Karadi, *Rock* 23870 ; between Hunka and Woloho, *Schneider* 1512.

N.W. YUNNAN : Atuntze, *Kingdon Ward* 157 ; Doker-la, *Kingdon Ward* 711 ; eastern flank of the Lichiang Range, 27° 16′ N., *Forrest* 2390 (typus) ; ibidem, 27° 30′ N., *Forrest* 6156 ; eastern slopes of the Lichiang snow range (Yu-lung shan), Mt. Satseto, *Rock* 24877 ; Yun-lu shan, S.W. of Lichiang snow range, *Rock* 25050.

L. lophophorum subsp. **typicum** forma **wardii** (*Balf. f.*) *Sealy* **forma nova** foliis anguste loratis vel linearibus 6–10 cm. longis et 2–8 mm. latis distincta. Fig. 5, E.

Syn. *Nomocharis wardii* Balf. f. in Trans. Bot. Soc. Edinb. **27,** 297 (1918).

N. lophophora var. *wardii* (Balf. f.) W. W. Sm. & W. E. Evans in Notes Roy. Bot. Gard. Edinb. **14,** 120 (1925) ; W. E. Evans, ibid. **15,** 12 (1925).

N.W. YUNNAN : Ka-gwr-pw, *Kingdon Ward* 813 (typus) ; Atuntze, *Kingdon Ward* 156 ; Doker-la, *Kingdon Ward* 741 ; Mekong-Salwin divide, 28° 12′ N., *Forrest* 14109 ; ibidem, 27° 36′ N., *Forrest* 19846.

L. lophophorum subsp. **linearifolium** *Sealy*, **subsp. nov.** ; subspecies caule dense folioso, foliis 15–16 erectis linearibus flore flavo conspicue purpureo-maculato excedentibus insignis. *Bulbus* anguste ovoideus, 3–4 cm. longus, circiter 1·7–2 cm. diametro ; squamae numerosae, imbricatae, carnosae, ovatae et longe acuminatae (exteriores) vel lanceolatae, 3·7–2·8 cm. longae, 12–8 mm. latae. *Caulis* (a bulbo ad florem) 14·5–30 cm. longus, glaber, cataphyllis 2–4 oblongis obtusis

2·5–3·5 cm. longis 3–8 mm. latis exceptus supra basin per 6·5–13 cm. nudus, deinde dense foliosus foliis 15–16 erectis vestitus. *Folia* linearia, ad apicem sensim attenuata, 4·5–9·5 cm. longa, 5-2 mm. lata, supra saturate viridia, subtus pallidiora, glabra. *Flos* solitarius, horizontalis vel cernuus, pedicello 1·5-5 cm. longo. *Perigonium* campanulatum vel segmentis ad apicem coherentibus, 4–5 cm. longum, flavum intus purpureo-maculatum ; segmenta subaequalia, lanceolata vel anguste ovata in apicem longe acuminatum sensim attenuata, 4–5 cm. longa, 1–1·5 cm. lata ; segmenta exteriora ad basin leviter saccata brevissime canaliculata et purpurea ; segmenta interiora basi rotundata marginibus per 1 cm. erosulatis, intus a basi per 1 cm. purpureo-canaliculata utrinque per 5 mm. dense cristata. *Stamina* 2–2·3 cm. longa ; filamentis linearibus, 1·5–1·7 cm. longis ; antheris 7-8 mm. longis, dorsifixis, versatilibus, supra basin 2·5-3 mm. affixis. *Gynoecium* 1·8–2·5 cm. longum, ovario cylindrico 9-14 mm. longo, stylo superne sensim incrassato cum stigmate 9-11 mm. longo, stigmate 3 mm. diametro. Fig. 4, P-Q.

N.W. Yunnan : Chintsi Shan, west of Wei-Hsi, 27° 12′ N., 99° 12′ E., *Forrest* 30170 ; Kin-tzu shan or Dsho-yu nolu, district of Labako, west of Shi-ku, *Rock* 25158 (typus) ; Yun-lu shan, S.W. of Lichiang snow range, *Rock* 25057.

Alpine meadows 10500-13000 ft.

Lilium sempervivoideum.

The confusion with this species (fig. 3, F-I) of another, distinct, species, *L. amoenum* Sealy (fig. 3, B-E) has been discussed in the Botanical Magazine, N. Ser. t. 73, where *L. amoenum* is figured. As Léveillé's description of his *L. sempervivoideum* (in Bull. Géogr. Bot. **25,** 38 : 1915), is extremely brief, and as later descriptions under that name refer either wholly or in part to *L. amoenum*, it seems useful to give the following new description of Léveillé's plants.

Bulbus 2·5–4 cm. longus, 2·5–3·5 cm. latus ; squamae multae, lanceolatae, 2·3-2·9 cm. longae et 7-10 mm. latae usque ad 2·7-4·3 cm. longae et 8–12 mm. latae, imbricatae, carnosae. *Caulis* 20–45 cm. longus (ab apice bulbi usque ad basin floris), superne glaber, inferne asperulus, infimus radices emittens, a basi per 5-9 cm. cataphyllos 3-5 remotos membraneos vel suprema herbaceos ornatus, deinde foliis 20-40 (vel plures) linearibus ascendentibus confertissimis vestitus, floribus 1 raro 2 rarissime 3 patentibus vel cernuis terminatus. *Folia* linearia, obtusa, 2-6·5 cm. longa, 1·5–2·5 mm. lata (infima interdum usque 4 mm. lata), marginibus revolutis (in sicco), 1-nervis, supra intense viridia, subtus pallidiora. *Perigonium* infundibuliforma-campanulatum, 3-4 cm. longum, album, in dimidio infero dense et delicate rubro-maculatum ; segmenta exteriora anguste elliptica vel oblongo-elliptica vel lanceolata, apice obtusissima et dense papillosa, 3–4 cm. longa, 6-9 mm. lata, a basi canaliculo angustissimo viride (?) 7 mm. longo ornata ; segmenta interiora elliptica vel late elliptica vel ovata, ad apicem obtuse acuta vel rotundata et dense papillosa, 3–4·3 cm. longa, 1–1·5 cm. lata, a basi canaliculo viridi (?) usque 10 mm. longo ornata. *Stamina* filamentis gracilissimis 1·4–1·6 cm. longis ; antherae 6–8 mm. longae, dorsifixae, versatiles, ad filamentos 2-2·5 mm.

supra basin affixae, flavae (?) ; pollen flavum. *Ovarium* 8–10 mm. longum, viride ; stylus et stigma 1·5–2·2 cm. longi, stylus superne sensim incrassatus, stigma circita 3 mm. lata.

CHINA—E. YUNNAN : Siao-ou-long, *E. E. Maire* (Junio sine anno in herb. Leveilleo=herb. Edin. 57/1913 ; Julio sine anno in herb. Leveilleo =herb. Edin. 117/1913 ; Junio sine anno in herb. Leveilleo=herb. Edin. 2/1914).

Lilium souliei (*Franchet*) *Sealy*, **comb. nov.**

Syn. *Fritillaria souliei* Franchet in Journ. de Bot. **12,** 221 (1898)

Nomocharis souliei (Franchet) W. W. Sm. et W. E. Evans in Notes Roy. Bot. Gard. Edinb. **14,** 102 (1925) ; W. E. Evans, ibid. **15,** 40–43, t. 210 (1925), 197 (1926).

Nomocharis synaptica *Sealy*, **sp. nov.,** inter congeneros filamentis versus apicem sensim attenuatis in aristam flavam abrupte contractis, et tepalis interioribus in basin cristas longitudinales carnosas laeves instructis insignis.

Syn. *N. aperta* (Franch.) E. H. Wils. sec. Ward, Plant Hunting on the Edge of the World, 247, 271, 344, 373 (1930), *non* (Franch.) E. H. Wils.

Bulbus ovoideus, circiter 3 cm. altus et 2·5 cm. diametro ; squamae numerosae, erectae, imbricatae, carnosae, lanceolatae vel ovatae, 3 cm. longae et 8–15 mm. latae, sed interiores minores et intimae oblongae 1·5 cm. longae et 5 mm. latae ; radices crassae, carnosae, contractiles. *Caulis* 40–45 cm. altus vel 75–105 cm. altus *fide* Kingdon Ward, glaber, in dimideum inferiorem vel in partem tertiam infimam cataphyllis paucis valde remotis ornatus, ceterus foliosus, sub apice 2–3-florus, foliis 4 vel 6 terminatus. *Folia* anguste elliptica, longe acuta vel acuminata, basi cuneata, in plantis minoribus 4·5–5 cm. longa et 7–10 mm. lata, in plantis robustis 5·5–6.8 cm. longa et 1·2–1·7 cm. lata, floralia latissima, marginibus minute scabridulis, supra saturate virides, subtus pallidiora, ad basin utrinque villis instructa cetera glabra, costa et nervis lateralis uno vel duis utrinque nonnihil prominentibus. *Flores* in axillari folium solitarii cum folia una angusta ad basin pedicelli ; pedicellus 3·5–6·5 cm. longus, patens. *Perigonium* late expansum et breve concavum, circiter 7-7·5 cm. (10 cm. *fide* Kingdon Ward) diametro, album vel purpureo-roseo suffusum et irregulariter atropurpureo-maculatum ; tepala exteriora oblonga, acuta, basi rotundata, 4–4·2 cm. longa, circiter 1·5 cm. lata, ad basin macula intense atropurpurea circiter 3 mm. longa et 2 mm. lata cum macula flava minora instructa ; tepala interiora oblongo-ovalia, acuta, basi rotundata, 4–4·2 cm. longa, circiter 2 cm. lata, ad basin per 5 mm. longum et 8 mm. latum intense atropurpurea flavo-marginata in medio anguste canaliculata utrinque cum cristis laevibus carnosus flavopraefixis instructa. *Stamina* 13–15 mm. longa ; filamenti 10–12 mm. longi, paulum carnosi, leviter compressi, a basi versus apicem sensim attenuati, atropurpurei, in aristam flavam 2 mm. longam abrupte contracti ; antherae 4 mm. longae, dorsifixae, supra basin circiter 1–2 mm. affixae, versitales ; pollen ferrugineum. *Gynoecium* viride ; ovarium 8–10 mm. longum, stylo subaeqalium. Fig. 1, H-K.

Assam. Delei Valley, 28° 21′ N., 96° 37′ E., alt. 10000–12000 ped., 9/vii/1928, *F. Kingdon Ward* 8399 (typus in herb. Kew.).

The colours mentioned above are taken from the collector's notes, in which the habitat is described as follows :

" It grows on either side of the ridge, on earth slopes amongst loam and granite chips well out in the open where it can get the sun (when there is any) but amongst a host of other plants such as Rodgersia, Roscoea, etc. Not very abundant, two or three dozen plants seen, on one cliff only, where the Irises and Cypripediums grow ".

This species is a most interesting discovery inasmuch as it forms a perfect link between the typical *Nomocharis* species (*N. pardanthina*, *N. meleagrina*, *N. mairei*, *N. basilissa*, and *N. farreri*), which have the base of the inner tepals with low crests, and stamens with a fleshy cylindrical filament bearing a needle-like awn at the top, and the two other species, *N. aperta* and *N. saluenensis*, which have the inner tepals with swellings instead of crests at the base, and filaments gradually attenuated towards the apex and then suddenly contracted into an awn. *N. synaptica* combines the typical *Nomocharis* tepals with stamens of the other two species, and thus, as its name implies, links them together. The collector mistook it for *N. aperta*. In his published account (l.c. p. 271) he described the perigone as " heavily blotched with purplish crimson on a white or flushed satin ground ", while his field-label reads " perianth lobes suffused with purplish pink, and unevenly spotted all over with irregularly shaped dark purple blotches ".

Acknowledgements.

I am greatly indebted to Sir William Wright Smith, who not only gave me every facility for examining the material in the Edinburgh Herbarium, but also most kindly discussed the whole problem with me ; Sir William was also kind enough to send many specimens on loan for further study, and to read the manuscript when it was eventually prepared. I am likewise most grateful for the help given to me by Mr. David Wilkie. In addition my thanks are due to Brian L. Burtt, Stella Ross-Craig, William T. Stearn, and Dr. W. B. Turrill, all of whom have been good enough to discuss the problem with me, and criticise the manuscript, while I am under a further obligation to Miss Ross-Craig for advice and assistance in the preparation of the plates.

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NOTES ON EARLY KEW AND THE KING OF HANOVER.

G. MALDEN WILLIS AND F. N. HOWES.

It is common knowledge that Prince Ernest, Duke of Cumberland, the fifth son of George III and later King of Hanover, resided at one time on Kew Green. The older part of the present Herbarium building housing the Library, the Herbarium " Stores " and the residence now known as " Hanover House " at the corner of Ferry Lane all formed part of his establishment. Parts of the original buildings have long since been demolished. Little appears to have been recorded in print concerning the early history of these old buildings and their surroundings, or the changes that have taken place during the two hundred or more years of their existence. Examination of some old records at Kew by one of us (F.N.H.) combined with a close study of the relative history of that period made in this country and on the Continent (G.M.W.) has brought to light certain interesting points which it is thought desirable to place on record.

In order to prevent misunderstanding it may be pointed out that Prince Ernest had lived previously in a house on the south side of Kew Green, namely, that now known as " King's Cottage ", nearly opposite the Church. This old house (now a Grace and Favour residence) was for a long period known as " Church House ". It is situated to the east of another old building of much historic interest, " Cambridge Cottage ", now a museum, an interesting account of which has recently been published by Cotton.

SIR PETER LELY'S HOUSE.

In the latter part of the seventeenth century a series of fashionable residences extended in a westerly direction from the north-west corner of Kew Green, more or less parallel with the river. Of these only the building now known as Kew Palace, formerly called the "Dutch House", survives. Its owners, the Fortreys, were not the only Dutch immigrants to settle here. Sir Peter Lely, the well known artist, had a residence on or near the site of the present Herbarium building. Its exact location, however, does not seem to be known, but it is believed to have been to the west of the Herbarium entrance (Thiselton-Dyer).

Sir Peter Lely had come to England with William of Orange when he married Princess Mary in April, 1641. He acquired the copyhold of the property at Kew from a Mr. Mountney for nineteen pounds per annum, and resided there during the summer months.

Upon his death in 1680, there followed protracted legal complications, as his son John had been born before the marriage and his competence to succeed to the estates was therefore a matter of some doubt. In all these troubles, the family advisor was Roger North, a lawyer son of one of the Lords North, and he served them faithfully. The matter was simplified by the fact that the land was held by copyhold, that is, at the will of the lord of the manor, at this time the Duke of York. The Duke was much irritated by the whole proceeding and finally granted the rights to North himself, who honourably passed them on to his friend and client. John Lely continued to reside by the Green ; he was still alive in 1719 when he was nominated in the will of Lady Capel one of the trustees for her intended Charity School.

In the first half of the eighteenth century, previous to 1742, the Lely's house was demolished.

Meyer's House.

That indispensable source of local history, Burrell's map, shows that in 1771 the space at the corner of the Green was occupied by a large house (later known as Hunter House) and a smaller house at the corner of and alongside the lane, which also took its name, " Meyer's House ", from the occupier, Jeremiah Meyer. Today, these are known respectively as the Kew Herbarium and Library and Hanover House (57 Kew Green), though, as will be described later, the two together formerly constituted " Hanover House " when it became the residence of the King of Hanover.

Meyer was another artist from abroad who had settled in England and enjoyed Royal patronage. He was brought from Wurttemberg by his father in 1749, when he was fourteen. He studied in London and then specialised in miniatures and enamels, bringing himself to the Royal notice in 1761 by winning a prize for a profile of the King which was used on the coinage. Thereafter he painted for the Royal Family and contributed many of their portraits to the exhibitions of the Royal Academy, of which he was a foundation member. He died at his Kew home on January 1st, 1789, from a fever, said to have been the result of waiting in a damp room while enquiring of the King's health. His widow, Barbara, continued to live in the house until her death on April 18th, 1818, when, like her husband, she was buried in the churchyard on Kew Green. It is said she did not have an easy time, having been left with several daughters whom her husband had neglected. One ran away and was brought back by Englehardt, another miniaturist who lived on the Green. At a time when another of them was ill and a rumour had spread that her complaint was contagious no tradesman would deliver at the house.

The present Ferry Lane which runs from Kew Green to the Thames was then called Meyer's Alley and for a hundred years or so after Meyer's death.

Hunter House and its Occupants.

The larger house now forming the Kew Library and Herbarium offices was occupied in 1771 by Mr. Peter Theobald. Not much is known about him, but he seems to have been very wealthy, to have contributed generously to the local charities and played a part in the life of the parish, for he was a churchwarden in 1760 and later a treasurer of the local charity. Among his benefactions were a regular contribution to the support of the minister and a donation of £200 towards the purchase of a permanent residence for him. Out of gratitude, the Vestry petitioned that he might have three pews annexed to his mansion and estate by faculty. The land to the westward of the house belonged to the Earl of Effingham and after the death of the Dowager Countess, about 1775, it was bought by Theobald to form its grounds. On his death on August 29th, 1778, his widow continued the family tradition of local benevolence and when she died in 1796, a memorial was dedicated to her on the south wall of Kew church. Both the Theobalds lie in the churchyard on Kew Green.

After their death the house came into the possession of the Hunter family and was known as " Hunter House ". Robert Hunter was a Scotsman who had come south and became a prominent London merchant. So respected was his judgement that Pitt was in the habit of consulting him on commercial matters. He also gained a high reputation for integrity and public service. When money was granted for the relief of the West Indies islands of St. Vincent and Grenada, after their volcanic and other calamities, Pitt persuaded him to become one of the commissioners and it is related that, though the commission functioned for fourteen years and over £1,400,000 passed through the office, not a shilling was lost, either of principal or interest, when the accounts were wound up, and all this efficiency was attributed to Hunter. He was among the founders of the Marine Society, and, again at the solicitations of others, he became one of the directors of the London Docks, then first projected. Courage was also among his good qualities. On March 22nd, 1769, when London, at the time of the Wilkes riots, was totally in the hands of a murderous mob, he was one of the group of prominent merchants who made their way from the City to St. James' to present an address of loyalty to the King. They had to fight a passage the whole distance and when at last they arrived, they were in rags and covered with dirt, several carriages had been "demolished" and two-thirds of the number were missing. Hunter, however, was one of the stout-hearted who arrived.

His last public work was as a commissioner of the Royal Naval Asylum, a home for the orphans of sailors killed on active service. He married Miss Lowis of London, who died in 1808. He himself died on August 4th 1812, at Hunter House within two months of attaining the age of eighty. He is buried under the south aisle in the church. Hunter is reputed to have been on very friendly terms with the elder Aiton who lived for a time in Descanso House (199 Kew Road), the present residence of the Assistant Director. An obituary of Robert Hunter appeared in the "Gentlemen's Magazine" of 1812 (Vol. 82, p. 406). He had seven children. At the time of his death four were alive, three sons and a daughter.

About this time, we find the inhabitants residing near Kew Green much concerned in local affairs. In 1810, they protested at the digging of a drainage-ditch from the barracks which were on the south side of Kew Green (to the west of Cambridge Cottage) across the Green to the river, via the lane between Meyer's and Dr. Tyrrell's house (i.e. Meyer's

Alley or Ferry Lane). All workmen engaged upon this objectionable innovation were warned that it was at their own peril ! Eventually, a compromise was reached, but, the next year, we find the lane again causing trouble, Dr. Tyrrell being given permission by the Vestry to erect a gate across it to keep out loiterers at night (from old records at Kew Church).

By this time, the two houses at the north-west corner of the Green were attracting the attention of the officials of the adjacent Botanical Gardens. Sir Joseph Banks desired premises for a library of which Mr. Francis Bauer, the famous draughtsman and artist of the Gardens (who lived in a house near the pond at the north-east corner of Kew Green), was to be the first librarian. He urged the Prince Regent to buy the two houses and this was done in 1818. Hunter House was then occupied by Robert Hunter, the eldest of the four surviving children of the original Robert Hunter. Meyer's house was vacant as Mrs. Meyer had just died. Work began on the conversion of Hunter House in 1820 but all that was actually accomplished was the fitting of shelves in the first room on the right on the ground floor (the present " visitors' room ") for Banks died and the library project was dropped.

For about ten years the two houses (Hunter's House and Meyer's House) remained empty and unused. They seem to have been the subject of some vague financial transactions for it is stated that George IV sold Hunter House to the nation in 1823. (Thiselton-Dyer). It was not until the accession of William IV that social and political events again brought importance to the houses.

PRINCE ERNEST, DUKE OF CUMBERLAND.

The King's brother, Prince Ernest Augustus, Duke of Cumberland, was a remarkable figure of the history of those decades. Born in 1771 at Kew, the place he loved all his life, he lived a secluded life there until he was 15 when he was sent to the University of Gottingen in Hanover. At the age of 19 he was appointed to a commission in the Ninth Hanovarian Light Dragoons. He was later renowned for his military courage. By nature he has been described as direct, tactless and hard. He represented the principles and traditions which we associate with rural and pre-industrial England at a time when new ideas and developments were changing the face and life of the country. As one would expect, he became the object of hatred and fear to certain circles. His marriage had not been one of those political arrangements which people seem to expect in relation to a Prince, for his wife, Princess von Solms-Braunfels, having previously jilted his brother, the Duke of Cambridge, the Queen would not, as a result, receive her at court. Parliament, at that time ever-ready to seize an opportunity to injure a Prince, especially one such as he, would not allow him the money to be able to live in England, so he had been driven from his native land. Now, however, his brother William IV was more sympathetic towards his wife, and he returned to England, but, here he soon became the victim of a ferocious campaign to drive him abroad again ; hideous slanders, mobbing, were alike employed, but he lacked neither courage nor will-power. On the battlefield, he had, besides receiving a sabre-cut across his face, lifted a French trooper from his horse and carried him back to his lines a prisoner. Now he resolved, come what may, to settle in England and sent for his wife. It was then that the King gave him for the life of himself and his wife the residence at Kew, i.e. Hunter House and Meyer's House. John Smith, who later became the first curator of the Gardens in the time of Sir William Hooker, witnessed the event and described it. He relates how the Duchess fell on her knees to thank the King. If one remembers what she and her husband had been through during the last fifteen years, one can well believe it. An account of Prince Ernest has been given by R. Fulford and P. Fitzgerald.

At the time the present Kew Bridge was being built, to be officially opened by King Edward VII, accompanied by Queen Alexandra, on 20th May 1903, a writer in a current journal (" Modern Society ") in referring to the historic nature of Kew stated, " Those time stained bricks on the front of Hanover House are the same which saw the unwelcomed Duchess of Cumberland descend from the chariot which brought her from Gravesend after her marriage with the youngest and most hated son of George III. Duke Ernest and his bride braved it out with heroic or brazen indifference. The big red [?] house on Kew Green was smartened up, and its stables were filled with the handsome horses the Duke knew so well how to choose. And there, on the top of the wide oak staircase the new Duchess stood glittering with jewels, to receive such of the English great people as chose to be at Hanover House ". The fine staircase with its carved balusters has remained much the same as it was then and is believed to be the finest in Kew.

As we have seen, Hunter House and Meyer's House had become one establishment, together forming what came to be called " Cumberland House ", the " King of Hanover's House " or simply " Hanover House ". Thus the name Hanover House originally referred to the two separate houses, run as one establishment, whereas later, as at present, the name Hanover House was used only for what had been Meyer's House (now 57 Kew Green). It is believed that this house, i.e. Meyer's House, was apportioned to Prince George, the Duke's eleven year old son, and later King George V of Hanover (the Blind King).

A porter's lodge was built in front of the mansion and projected into the road. Its exact location may be seen from the map of 1852 (p. 000). An old photograph showing this lodge, probably taken not long before it was demolished, was reproduced by Cotton in the Journal of the Kew Guild for 1944 (vol. 6, no. 51, opp. page 399). It is apparent that this lodge was situated more or less immediately in front of the present Hanover House, with gates facing roughly east. According to Goldney the lodge was pulled down towards the end of last century on account of the obstruction it caused to the road. The large plane trees now at the side of the road must presumably have been planted subsequent to its demolition and may not therefore be more than about 70 years old.

The stables, coachhouse, glasshouses and other offices of the mansion are said by John Smith to have been beyond what is now No. 1 Conservatory, the present Aroid House, near two large elms.

The Duke and his family dwelt in the mansion for six or seven years, until his accession to the throne of Hanover in 1837. They were not years of great happiness, for, apart from the enmity and malice with which they were surrounded, it was here that in 1832 his only son became blind (referred to later). The Duke and Duchess were beside themselves in their distress and travelled across Europe seeking medical advice. From then on, medical attendants were kept in residence at Hanover House.

Understandably, the Duke was not fond of London and passed a fairly retired life. He had spent his childhood at what is now King's Cottage, south of Kew Church, and loved Kew, where, at least, he had friends. His name appears on the subscription lists of all the local charities. Princess Lieven, wife of the Russian Ambassador, after dining with the Duke on the 30th September, 1832, wrote to Lady Cowper, " The Cumberlands beg you with all their heart to spend a day with them at Kew. From the terrace you can see the comet, and every night now there is a bright moon ".

As King of Hanover, Ernest used often to indulge in reminiscences of his life at Kew, especially as the old faces and scenes disappeared. On the death of his friend, Sir Charles Wetherall, in 1846, he wrote . . . "many and many an hour have I passed with him in a small library I have at Kew, where we used to dine in winter, and have sat conversing and debating with him . . . until two or three o'clock in the morning, totally unaware of the lateness of the hour . . . "

Only nine months before his death, he wrote respecting the detested Industrial Exhibition of 1851, that if he were to visit England, he would not set a foot in Hyde Park, but would instead " remove quietly and enjoy the fine weather and sweet scents of my little cottage at Kew ".

By that time, Kew had ceased to be a great political or social centre, and, though it was yet to become world-famous in another sphere, had then quite lost its importance. Ernest was very bitter about the decay of his village, writing at the time of Queen Victoria's marriage " . . . the country will all be lost and every vestige of monarchy gone. Rapid strides are daily making towards the completion of this. They have already taken away the Guards from Kew, where so much royal property exists ; and now I hear they are going to remove me from my rangership there, and to let at Lady-day the deer park to the first bidder, probably a London Radical butcher . . ." (P. Fitzgerald p. 287). On his death, the parishioners of Kew sent an address of condolence to his blind son, who, in his reply, expressed his intention of continuing to contribute to all the local charities as his late father had done, even as King of Hanover.

Hanover House had remained with the family until the death of King Ernest in 1851, though he only visited England once after his accession, in 1843, when he stayed three months. On this occasion he was universally feted, so much so that the jealousy of the Prince Consort was aroused. He coolly showed his German officers over the room in St. James's Palace where, in 1810, an attempt had been made to assassinate him as he slept in bed, but he also took them to places of more congenial memory, for he spent as much time as possible at Kew, including every Sunday during his stay, and so after six years' silence, Hanover House became again the scene of parties, of music and gaiety. But it was for the last time ; the King returned and once more the only inhabitants of the house were his caretakers.

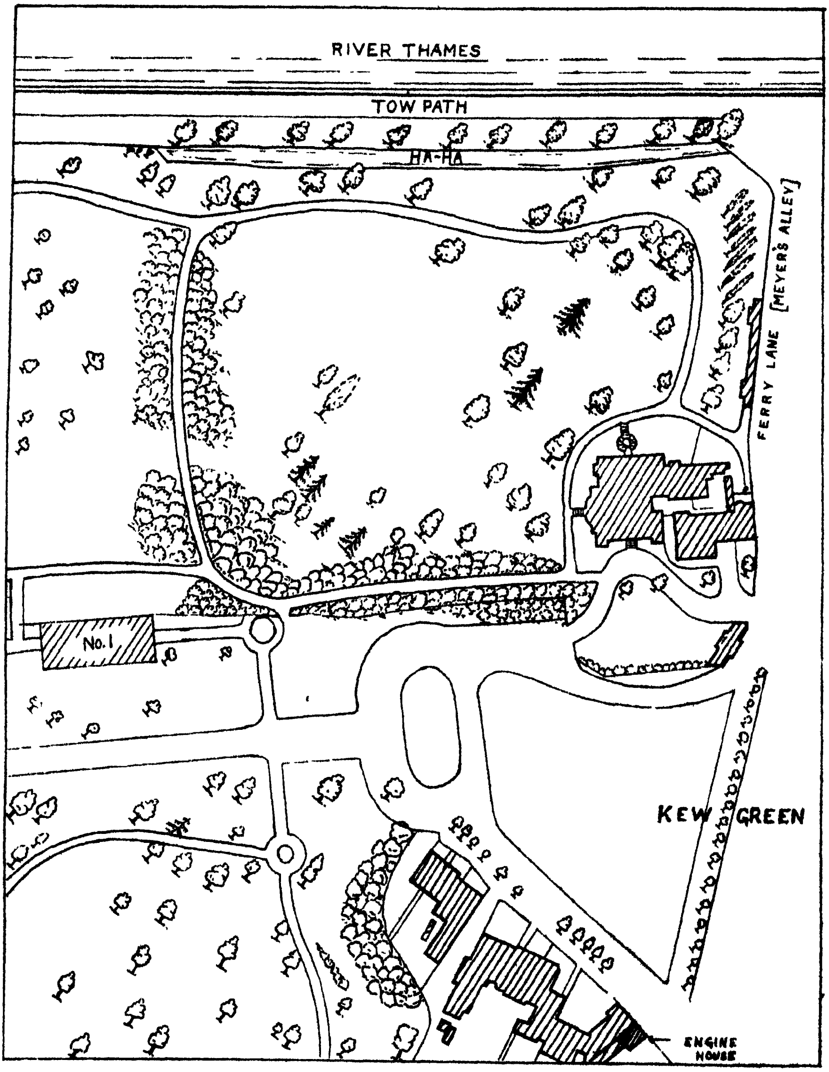
It would seem that the garden and grounds surrounding the house were maintained in good condition while the Cumberlands were in residence. The wife of the Prussian ambassador Heinrich von Buelow, writing to her sister (10th May 1833) remarked, " I really reproached myself when I was walking last Sunday morning in the Duchess of Cumberland's garden at Kew (as she is still at Hastings I have permission to go there whenever I like), enjoying the charm of the place in its attractive spring dress and moved, as I always am, by the glorious works of God in nature ; I imagined the poor Duchess's feelings when she returns to find everything in her garden fresh and blooming, and knows that her beloved child can see little or nothing of all this beauty ".

With regard to the actual date when the Cumberlands took up residence at Hanover House it is of interest to recall that in the columns of the *Times* of 1831 it is recorded that the King went in his carriage to Kew on 17th September, 1831, to see the improvements being made at the house and that on the 17th October, 1831, the Duchess gave an "elegant dejeune " at the " new residence " in honour of the Grand Duchess Helen of Russia, also that among the guests were the Prince of Wuerttemberg and Prince Lieven.

A copy of a letter in an old file in the Registry of the Gardens, dated 11th August 1847, indicates that, at that time, the House, or parts of it, were showing serious signs of decay. The letter was presumably intended for the representative of the King of Hanover in this country and reads as follows :

" On behalf of the Commissioners of Her Majesty's Woods I am to acquaint you for the information of the King of Hanover, that according to reports lately made to this Board by the Surveyor of Works and Buildings and by the Clerk of the Works in charge of the Kew District it appears that the mansion near Kew Palace, occupied by the King of Hanover, when last in this country, and now in charge of some house servants is most seriously affected by Dry Rot, which is very apparent in various parts of the building, but that the extent cannot be ascertained, nor the cost of repairs estimated without such investigation as would involve the temporary removal of much valuable furniture in the first instance and the subsequent removal and renovation of all such portions of woodwork, fittings and furnishings as are either destroyed or materially damaged by the disease, that the execution of these works would necessarily require the redecoration of some of the principal apartments the whole cost of which would be very considerable, and that this Board having no authority to incur expense upon the mansion in question, nor any available funds for that purpose, feel it their duty to apprize you of the circumstances in order that you may communicate the same for the information of the King of Hanover and that His Majesty may make any provision or give any direction for the preservation of this building, and the furniture and property therein, which to His Majesty shall seem fit ".

In 1850, the King of Hanover's Kew residence was associated with an interesting event, for in July, his brother, the Duke of Cambridge, died and as Cambridge Cottage was under repair at the time of the funeral,

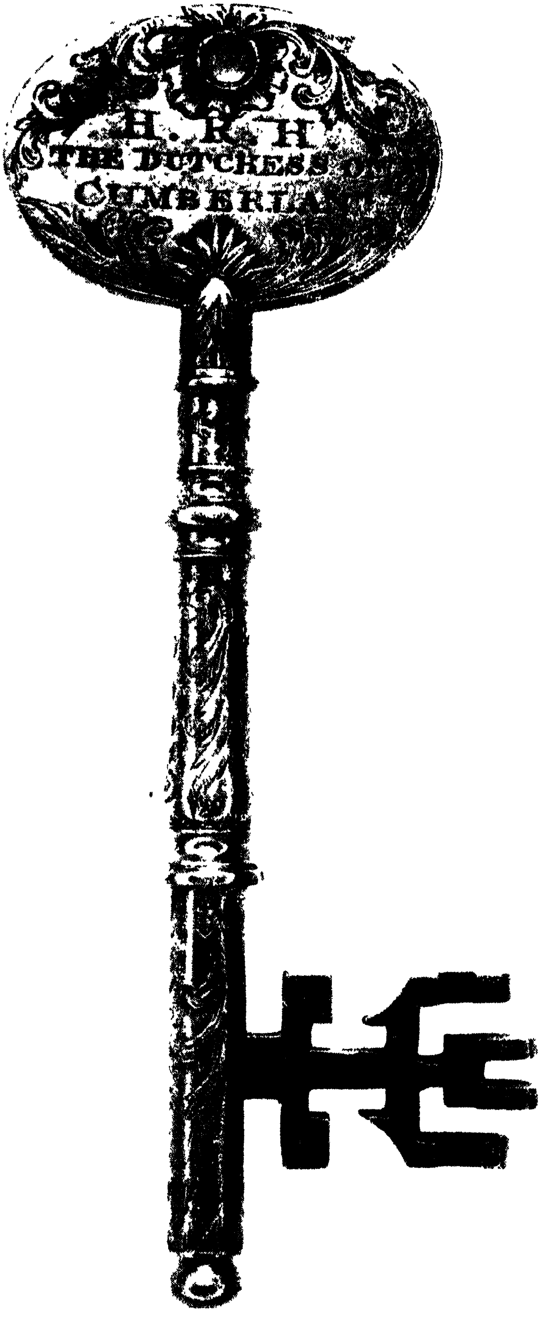


Reproduced from " Map of the Royal Gardens and Pleasure Grounds at Kew. 1852. (prepared by Day and Son, Lithographers to the Queen)."

Plate 1.

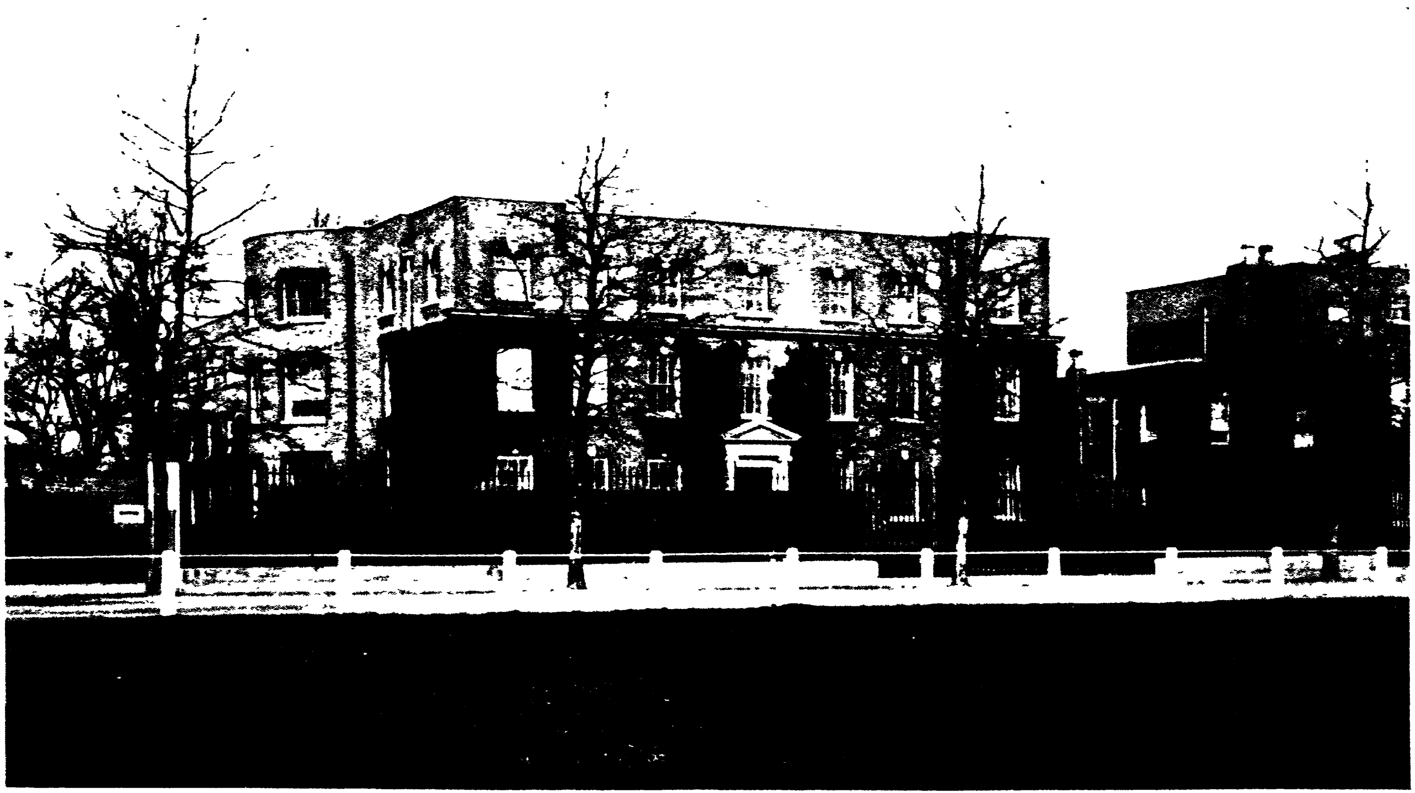
H.R.H. Prince Ernest, Duke of Cumberland and King of Hanover.
Reproduced from a German portrait (by Oesterley) which was presented by the King of Hanover to Sir William Hooker in 1846.

Plate 2.



The "Personal Pass" key to the Royal Botanic Gardens, Kew, which belonged to the Duchess of Cumberland: now in the Museum at Kew. Note the unusual spelling of the word Duchess.

PLATE 3



The Kew Herbarium as it was at the latter part of last century before the addition of the Second Wing. The photograph clearly shows that part of the adjoining building " Herbarium Stores " (once used as a residence and later demolished to reduce fire risk to the Herbarium (from an old undated photograph by Mr Fred Turner, F.R.Hist.S., Brentford, and restored by Mr. G. Atkinson, Oct. 1949).

the mourners assembled at Hanover House, among them the Prince Consort, the Duke of Wellington, Lord Palmerston and Sir John Russel.

The next year, on the 18th November, King Ernest Augustus himself died. The house reverted to the Crown and his hatchment, now preserved in the church on Kew Green, must have been his last personal link with it.

In the churchyard, there is another reminder of his local associations. Before becoming King of Hanover, the Duke of Cumberland was Colonel for many years of the 15th Light Dragoons (later 15th Hussars), in which he took a keen interest long after he had relinquished the appointment. A sergeant of the regiment lies buried on the north side of Kew church. The greater part of the inscription on the gravestone is still legible, but the bottom portion has weathered with age and fallen away. As it may not be legible much longer it seems desirable to reproduce it. It reads—" Here lies the Body of James Harper formerly Sergeant in the 15th Regt. of Hussars, and many years in the Service of His Royal Highness the Duke of Cumberland. He departed this Life on the 14th day of August 1839, in the 60th Year of His Age. This stone was erected by the King of Hanover, to accord His Majesty's regard for the Memory of a bold and dutiful Soldier—Honest, Zealous . . . . " (the last few words of the inscription have unfortunately disappeared).

That as a King in far-away Hanover, Ernest Augustus should have remembered this humble sergeant and, hearing of his death, provided a gravestone with an epitaph written by himself personally testifies to his deep and undying attachment to those who had served him. To anyone who has read the Duke's correspondence the style of the inscription is instantly familiar.

John Smith's Account of Changes around Kew Green.

After the death of George III in 1820 various changes took place on the ground which is now represented by the extreme western portion of Kew Green, i.e. the ground immediately in front of the original Hanover House. An interesting account of these changes has been given by John Smith, the first Curator of the Gardens, in his manuscript on the early history of the Gardens. This manuscript is now preserved in the Kew Library. As it was not received at Kew until 1913 (vide Kew Bull. 1913, p. 62 : 1914, pp. 85–6) it is probable that earlier writers on the history of the Gardens (e.g. Thiselton-Dyer 1891 : Bean 1908) did not have access to it. It may be desirable to give John Smith's account of the changes, which took place after 1820, in his own words. The account was probably written about 1880, long after his retirement, from notes collected during his long career.

He started work at Kew, as he states, " in the spring of 1820 " under the directorship of William Townsend Aiton who had succeeded the elder Aiton in 1793. For 18 years he was " foreman " of the Gardens and was officially appointed Curator in 1841, the same year in which Sir William Hooker was appointed Director. He was superannuated in 1864 when his eyesight was failing, having served the Gardens for 44 years. He appears to have lived many years in retirement at Kew.

In his manuscript John Smith states :—

" On the death of George III in 1820 the Prince of Wales, who had for several years been Regent, became King as George IV, and considerable alteration took place in the garden and especially with regard to Kew Green, at that time the west end of which formed a narrow neck extending westward bounded by the Palace garden wall which then ran from the back of the Palace stables northward to the river.

In the south this narrow part of Kew Green was bounded by the wall of the original arboretum, which ran in a nearly south-westerly direction from the west end dwelling house (now, 1880, occupied by Professor Oliver) terminating at the Palace stables (now the cloakroom).

On the north by a wall running nearly parallel with that on the south which separates a portion of the Green from the mansion and grounds of Mr. Robert Hunter, which extended northward to the river, these two walls were each bordered by a row of trees planted by George III, that on the south by horsechestnuts and on the north by limes. They formed fine promenades for the parishioners. One was called the Chestnut and the other the Lime tree walk. Several trees of each row and a part of the north wall still remain (1880).

In 1818 the mansion and grounds of the late Robert Hunter were purchased by George IV as also the two adjoining houses for the purpose it is said of making it an occasional summer residence. It was to be called the King's Lodge, and on the recommendation of Sir Joseph Banks there was to be a library of botanical books formed and an herbarium, but on the death of Sir Joseph Banks in 1820 and some other causes the formation of the library was given up and the house remained unoccupied during the lifetime of George IV and nothing was then done to the house except keeping it in repair.

The grounds consisted of about [6½] acres divided into two parts, that next the house being planted with cedars and rare trees. The other containing a row of glass houses consisting of a greenhouse in the centre with the vineries and a peach house on each side as also a kitchen garden and orchard next the river. In order to make the property private the King in 1821 obtained an Act of Parliament which authorized the inhabitants of Kew to cede the narrow portion of Kew Green to the Crown in return for which the school house was erected [King's School, Kew Green], the Green enclosed and privileges granted and improvements made in the Parish.

In 1822 the newly acquired Royal property was separated from the public Green by a high iron railing which stretched from the buildings on the south side (from what is now the engine house) across the Green and terminating at the top of the road that leads to the river. In the centre of the fence was a carriage gate and a lodge on each side of it, and a stone figure of a lion on the one and a unicorn on the other. A border of thick shrubbery was planted inside the railings and on the public side a row of lime trees was planted and a gravel walk made and it formed a nice promenade for the parishioners (the trees, walks and wire fence still remain, 1880).

At that time the public entrance to the Botanic Garden was by a small wooden door in the arboretum wall near to where the walk turns off to the left just within the present entrance and the entrance to the pleasure grounds was by a door in the same wall.

In consequence of the enclosure of this part of the Green these two entrances were done away with, and a new entrance to the Botanic Garden made on the ground now occupied by the engine house and part of the space at that time occupied by barracks [the area to the west of Cambridge Cottage]. This new entrance consisted of two gates, one door (where the engine house now stands) for the public, the other a double door for workmen and carts. The pillars of the gates were of substantial hewn masonry, the doors being of oak; these gates were conspicuous on entering Kew by the Bridge. This entrance was consequent on the original plan not being carried out which was that the row of houses now the Director's, Curator's and others to be taken down as also the north wall of the arboretum, thus adding the newly acquired piece of Green and the space occupied by the house and their gardens to the arboretum (still in its original state, 1880), and that portion in front of the Royal Lodge was to be ornamentally laid out. These alterations were planned by Mr. Aiton, the Director, and approved by George IV with whom he was a great favourite, but at the last moment court influence prevailed with the King and prevented the houses being taken down.

A carriage road was formed through the centre of Kew Green, the public road having swing gates hung on low strong pillars, this road passed between the two lodges and on to the palace. It was formally opened by George IV as also the new entrance to the Botanic Garden.

Although these changes took place nevertheless nothing was done during the reign of George IV to add to or improve the Botanic Garden in consequence of part of the money allowed for the maintenance of the Botanic Garden being required by George IV to make improvements in the cottage grounds at Windsor Park. The hothouses and buildings were, however, well maintained and improved by the Board of Works who had a separate grant of money for such works.

I now come to speak of the alterations and improvements that took place in the reign of William IV [1830–1837] who was fond of Kew, to which while Duke of Clarence he paid frequent visits and took much interest in planning and suggesting improvements of what he would like to see done in the Gardens, and was not pleased with what George IV had done, especially in taking down the palace erected by their father, enclosing the portion of Kew Green and building the lodges on the Green. In becoming King in 1830, it was not long before he visited Kew and one of his first acts was to present the house (the Royal Lodge purchased by George IV) [in turn Hunter, Cumberland or Hanover House] to her Royal Highness the Duchess of Cumberland, for her life, and the same day he gave orders that the iron railing and two lodges put up by George IV should be removed, which was shortly afterwards carried into effect, and the iron railing was put further back so as to exclude the houses on both sides and leave the approach to them open to the Green.

The road through Kew Green was broken up, and the carriages to the palace, Royal or otherwise, had to go by the road to the river and along the riverside. He also used part of the railing for enclosing a portion of the ground in front of the house, now the Duke of Cumberland's, in order to make it private, and he erected a porter's lodge. The row of lime trees and the walk were also intended to be done away with and all vestige of fence ever having been there to be removed, so as to again restore that part of the Green to the parish. The walk was begun to be picked up, but a trifling incident on the part of the Duke of Cumberland caused its stoppage, and as no further notice was taken of it, the picked up part was made good and since then it now remained (1880) as it was then, and nothing has been done with the enclosed piece of Green and the portion of ground between the houses has remained unoccupied".

The lime walk referred to in the last paragraph is now represented by the footpath that runs across Kew Green at its western end, from north to south, near the Main Gates, and often referred to as " bird cage walk ". It is still planted in the main with lime trees, although these are of various ages. It is probable that the four largest of these trees at the south end are the remainder of the original lime walk planted at the instigation of George IV in the early part of his reign, in or about 1822. The average circumference of these five trees at breast height is now (Aug. 1949) 6 ft. 8½ ins., which is compatible with the trees being of this age, having regard to their growing in what is naturally a poor gravelly soil.

At about the middle of this lime walk stood the main entrance gates to the Gardens with their two imposing lodges which were erected by George IV (already referred to in John Smith's narrative). The position of these gates may be indicated by the present low iron fence that runs along the walk on the east side, for it may be observed at the present time that in about the middle there is a length of fencing that differs from and is not in alignment with the remainder of the fence.

The gates were not destined to remain for long as William IV did away with them soon after coming to the throne. The lion was later erected on the Lion Gate and the unicorn at the Unicorn Gate in the Kew road. There they have remained up to the present day.

The changes that took place to the approach of Hunter House or the original Herbarium building when it became the residence of the Duke of Cumberland, to be known as Cumberland House and later Hanover House, have already been outlined. Important features were the amalgamation of the corner residence, what was Meyer's House or the present " Hanover House " with Hunter House, and the establishment of the porter's lodge already referred to.

TRANSFORMATION OF THE ORIGINAL HANOVER HOUSE INTO THE PRESENT HERBARIUM AND LIBRARY.

A study of the 1852 map (opposite p. 000) reveals some interesting points. The extent of the original Hanover House grounds, now represented in the main by what was until recently the " Herbarium meadow", was about 6½ acres. They adjoined those of the Palace Gardens although the boundary between the two does not appear to be clearly defined on the map. John Smith in his unpublished notes describes the existence of " handsome and rare trees " in the ornamental part of the grounds near the mansion and refers to cedars. Probably some of the fine cedars still in the grounds existed at the time of the King of Hanover as young trees.

The ha-ha along the tow-path at the back of the Herbarium buildings' so clearly shown on the map, has long since been demolished. It was probably replaced by the present brick wall. There would seem to be fairly good evidence that the wall was in existence in 1877. One of the older employees in the Gardens (Mr. F. G. Frost), whose father worked in the Gardens before him, states that his father had told him he remembered the ha-ha there.

With regard to the buildings, the changes that have been made to the original Herbarium building since the days of the Duke of Cumberland or King of Hanover are very obvious on glancing at the map. We are told that after the death of the King of Hanover in 1851 the house continued to be unoccupied. This map of 1852 therefore probably depicts the lay-out of the mansion as it was in the King of Hanover's time. The most striking feature is perhaps the extent to which the main building stretched towards Ferry Lane, behind the " Herbarium Stores " and the present residence of Hanover House. This part of the building probably constituted the domestic quarter, kitchen, servants' quarter, etc. It would seem that the main building was not completely connected with the Herbarium stores and present day Hanover House as is often supposed, but that there was a gap or passage way between them, possibly a servicing road or path.

A large old mulberry tree exists on the lawn at the back of the present day Hanover House. An old resident of Kew (a Mr. Jurd, recently deceased) who lived in the present Hanover House as a boy, when his father was Clerk of Works, stated that he remembered climbing on the roof of a building in order to pick the mulberries. There is no such building at the present time but doubtless the building referred to is that shown on the 1852 map, i.e. the long narrow structure running parallel with Ferry Lane with its southern extremity near the bay window of the north living room of the present Hanover House. At that time there was also a long narrow building against the high brick wall that separates the garden from Ferry Lane. This may have been an out-house of some sort, long since demolished.

It has already been pointed out how, in 1818, at the suggestion of Sir Joseph Banks, who was friendly with George III, Hunter House was purchased by the Crown with a view to using it as a herbarium and library for the Botanic Garden. What is now the " visitors' room " in the Herbarium had shelves fitted round it for the purpose but as Sir Joseph Banks (and George III) died in 1820 the project was dropped. The building appears to have been unoccupied until about 1830. After that it was in the hands of the Duke and Duchess of Cumberland until the former's death in 1851 as already stated. Actually they only resided there until 1837 when the Duke became King of Hanover. On the death of the King of Hanover Queen Victoria granted the ground floor of the house to Sir William Hooker to house his own herbarium and library. There was no national herbarium, however, until the following year when Dr. Bromfield's library and herbarium were presented by his sister to the

Establishment. From that time onwards the building became known as the Kew Herbarium and it housed both the Library and large collection of herbarium specimens.

The first wing (" C wing ") was not built until 1877. In referring to this John Smith states, " The interior of the house was re-modelled, the dining room and back pulled down and the Herbarium gallery [i.e. the " Wing "] erected ". Presumably, therefore, the dining room was a room which stood where part of " C wing " now stands. The rooms which extended to the east (see map opposite p. 000), at the back of what is now the Herbarium Stores and the present Hanover House, may have been pulled down at the same time (1877). The porter's lodge, already referred to, may have been demolished then or later, probably later. The other two wings of the Herbarium (" B wing " and " A wing ") were completed in 1902 and 1932 respectively. Previous to 1932 Wings " C " and " B " were referred to as the " old " and the " new " wing.

Conditions in the Herbarium and Library, housed only in the old building or Hunter House, must have been very crowded before the first Wing was built in 1877. Even in 1904 when Mr. A. D. Cotton, for many years Keeper of the Herbarium, first came to Kew, he remembers there was much congestion in both the old part of the building and the Wing. On the ground floor of the latter there seemed to be cabinets everywhere, and as far as he recollects there were no sorting tables. Certain groups were still kept in the old house in addition to the library. What is now the visitors' room, which was then occupied by Mr. Massee, housed the Lower Cryptogams, the Algae and Lichens being in the small adjoining room to the east. The Ferns were kept in the present Keeper's room. Actually at that time it was hardly a room, as the partition had not been built and there was a through-way from the hall to the wing. There must have been, previous to 1902, a much finer view towards Kew Palace from the two bow-windowed rooms facing west, for the second wing ("Wing B ") and the corridors connecting it had not been built. This is apparent from the old photograph opposite page 000.

Dr. T. A. Sprague in his reminiscences (unpublished) of working conditions in the Herbarium between 1900 and 1906 states how the preliminary sorting of a large incoming collection had to be done in the cellars of the Herbarium as there was not sufficient space elsewhere. At that time, before the erection of the second Wing " Space in the herbarium cabinets was so strictly limited, that I remember being mildly hauled over the coals by the then Keeper (W. B. Hemsley) for laying out more than one sheet of a Costa Rican species which I could not identify, and which, years later, was described as new. With respect to old species, one was supposed to look through the covers to find a half-sheet, on which part of the new specimen could be mounted, the remainder being treated as a duplicate. Unfortunately Augustine Henry's earlier Chinese collections had suffered in this way, many numbers (of which he told me he had collected ample material) being accordingly represented at Kew by mere scraps, or even distributed as duplicates under the impression that they were previously described species. Accommodation in the cabinets was severely cramped until the provision of the new building (Wing B). In laying in, one had often to divide a cover of specimens into two, and shift the covers through one or more pigeon-holes, or even through an entire cabinet, in order to get the new material in.

Once a quarter we had the " quarter's sorting " of freshly mounted sheets, which for some years fell to my lot, as the junior member of the staff. This formed a most valuable training, by which one learnt the facies of the chief families of seed-plants and of many genera. Laying-in of the material was done by the Assistants (a title subsequently altered to Botanists) themselves, who in this way acquired a general knowledge of the groups under their charge which they could not have gained in any other way. I was responsible for the Thalamiflorae, Rolfe for the Calyciflorae and Orchidaceae, N. E. Brown for the Gamopetalae and Apetalae, and C. H. Wright for the Monocotyledons (except the Grasses) and the Pteridophyta. Stapf dealt with the Grasses. Skan had charge of the Library under Hemsley.

All Herbarium correspondence was in longhand ; there was no Clerk, no typewriter, and no system of " tags " in the Herbarium.

When I entered the Herbarium in 1900, Stapf was the only other member of the staff with a degree, apart from I. H. Burkill and H. H. W. Pearson who worked largely in the Director's Office, under Thiselton-Dyer. We all had to work much harder than the present staff. The pay of Assistants in the Herbarium was then so low that only those with a real love of systematic botany joined the staff. It was £80 per annum with a £10 increment. I should have been unable to exist on it but for an allowance from my father which for some years exceeded my salary. Some years later the initial salary was raised to £150, but those who had borne the burden and heat of the day did not reap the benefit ".

Inspection of the older part of the Herbarium building shows that two distinct periods are represented in the ornamentation, particularly in the ceilings, that in the visitors' room, the hall and the office being older than that on the first landing, which must have been modified with the alteration of 1877.

The Duke of Cumberland (before becoming King of Hanover) was colonel of the 15th Light Dragoons (later 15th Hussars) and it is said that his officers met regularly at Cumberland or Hanover House. The house may therefore have witnessed many gay or convivial gatherings in those days.

Most old buildings have their ghosts. That Hunter or Hanover House is no exception would seem to be established from the following remarks from the diary (31st July 1834) of the Duchess of Dino, wife of the French Ambassador. " In our drawing room the conversation turned on the talent of certain people for telling ghost stories. This reminded me of the interest with which two years ago at Kew I heard from the Duchess of Cumberland the story of an apparition seen by herself, the remembrance of which seemed to cause her much emotion. The impression she produced on me was the deeper as the hour was late and a terrifying thunderstorm was raging outside the house ".

AN OLD KEY.

An interesting relic of the days of the Duke and Duchess of Cumberland at Kew exists in one of the Kew Museums in the form of an old key which was apparently a personal key of the Duchess of Cumberland to enable her to enter one of the gates of the Gardens. It was presented to the Museum in 1919 having been acquired by a member of the Gardens staff (Mr. A. Osborn). This key, which is much ornamented as was the custom of those days, is in a remarkably good state of preservation, and appears to have suffered little with the passing of the years. A photograph of this key appears opposite page 000. It will be noticed that it is engraved " H.R.H. The Dutchess of Cumberland ", the unusual spelling of the word Duchess with a " t " as " Dutchess " being worthy of attention. It was at first thought this may have been an error on the part of the engraver but it has now been ascertained that this rendering was not unusual at that period. A note accompanying the key states that it " was known as the 'Personal Pass' key of H.R.H. The Duchess of Cumberland and was used by that lady to enter the Gardens when she lived in Hanover House, Kew Green. When the family left the house the key came into the possession of Mr. Williamson, Curator of the Richmond end of the Gardens. It was found among his possessions at his death ". Two other old keys of the Gardens in use about the same time are also in the Museum (see Kew Bulletin 1914, p. 89).

THE PRESENT DAY HANOVER HOUSE.

The residence now known as Hanover House at the corner of Ferry Lane, has been one of the official residences of Kew Gardens and occupied by senior members of the staff since the early years of the present century. Prior to that it had for many years been occupied by officials (clerks of works) of the Ministry of Works, or Board or Office of Works, as it was formerly called.

One of us (F.N.H.) is able to account for the occupants of the house during the last eighty years or so, but there is a gap from 1851, when it ceased to be in the possession of the King of Hanover on his death, to the time it was occupied by Mr. Jurd (who preceded Mr. Allen as occupant) possibly between 1860 and 1870. Other " Clerks of Works " may have occupied the house during this period or it may have remained empty for some time. The house has been occupied in turn by Messrs. Jurd and Allen (Office of Works), O. Stapf (Herbarium), J. M. Hillier, W. Dallimore, J. Hutchinson and F. N. Howes (Keepers of Museums).

Allen is reputed to have come to Kew in 1879, having been brought specially to take charge of the reglazing of the Palm House and other houses after the terrific destruction caused by a freak hail storm in that year when "the hailstones averaged 5 inches in circumference and descended with such violence as to bury themselves in the ground " (Kew Report 1879). Allen occupied the house for about 20 years and vacated it to live in one of the official houses near Kew Palace. It was then occupied by Dr. Stapf, who was Principal Assistant in the Herbarium at that time. When he moved to Herbarium House across Kew Green, on the retirement of Hemsley as Keeper of the Herbarium, the Keeper of Museums (Mr. J. M. Hillier) was given the residence. It is said that before Hemsley lived in Herbarium House he had lived in the house adjoining Hanover House, now the " Herbarium Stores ", presumably before a portion of it was demolished in order to lessen fire risk to the Herbarium. A good idea of the original building may be obtained from an old photograph reproduced opposite page 000.

It is stated that Allen, who had a large family, installed the bathroom while he occupied the present Hanover House, by partitioning off one of the top rooms, and that the house was the first of the official residences at Kew to possess such a luxury. Subsequent occupants of the house have always lamented the fact that Allen chose the second or top floor for the bathroom ! However at that time bathrooms were far less general than they are now. When Allen occupied the house the garden ran almost to the river—to the wall near the tow path, and included the area now occupied by buildings of the Commonwealth Mycological Institute. He is reputed to have erected a staging against the high brick wall at the end of the garden so that he and members of his family or their friends could sit and watch passers-by and activities on the Thames. The older fruit trees in the garden are said to have been planted by him. These include a very large *Blenheim Orange* apple tree, also a *Devonshire Quarrenden* and a *Fearn's Pippin*, all of which still (1949) bear good crops of apples although the last mentioned is now showing signs of age and the adverse effects of several years of neglect. The remaining fruit trees at present in the garden were planted by Mr. W. Dallimore in the early years of his occupation of the house (1925–30).

Various internal alterations have been made to the house and it has been modernized in many respects, although it is fundamentally the same as it was last century. The most notable of the alterations is probably the recent (1949) building of a proper kitchen on the ground floor by reducing one of the living rooms, in order to eliminate the use of the basement kitchen. Modern, more efficient fireplaces in the main rooms have replaced those of Victorian times.

THE DUKE'S BLIND SON.

It is generally considered that in the Duke of Cumberland's residence the building under discussion (the present day Hanover House) was probably used for the establishment of his son who later, on his father's death, became George V of Hanover or " the Blind King of Hanover ". It would seem not unreasonable to suppose, therefore, that the boy spent a good deal of his time in the garden or the immediate precincts of this house, and it may have been here that the accident took place that robbed him of his sight.

He was a brilliant and handsome boy, and much-liked, but he was not always spared by his father's political detractors, one of whom, Greville, wrote of him, when he was ten years old, " The Duke of Cumberland's boy, who is at Kew, diverts himself with making the guard turn out several times in the course of the day to salute him ".

About the same time, however, his studies were hampered by the loss of the sight of his left eye, generally attributed to the hereditary weakness of sight of George III's family. He was warned to be very careful of the other, but, alas, he was too full of youthful energy to take much heed and one day, while playing, he met with an accident that rendered him completely and permanently blind. During his lifetime, little was said on the subject and there were many speculations as to the cause of the misfortune. After his death, however, several eye-witnesses revealed the nature of the accident, their accounts differing only in that one described the flower-garden at Windsor as the scene of the event and the rest the garden of the house at Kew ; the latter has always been accepted as the authoritative by Hanoverian historians.

Apparently, the Prince was playing with his cousin, Prince George of Cambridge, carrying a long green silk purse, intended for the collecting of alms. It was decorated at either end with large gold tassels in the form of acorns and already, as he swung it in the air, one of these had only narrowly missed his face. He was immediately warned to be very careful of his eye, but he laughed at such anxiety, swung the purse again and it struck him heavily in the right eye.

The next day, the pain was such as to prevent his taking his usual exercises and doctors were called. They pronounced the dread truth ; the Duke, who would never despair, refused to believe them and took his son immediately to Berlin to the renowned specialist, Dr. Graefe. He had previously saved the Duke's sight, but now he could only confirm the opinion of the English doctors.

The exact date of this accident is fixed by a letter of Princess Lieven, who writes on the 15th September, 1832, " I found the Cumberlands yesterday in the most dreadful despair. George has suddenly gone completely blind. They put him in the sunlight, but he could see nothing at all. Can you imagine a more terrible misfortune for his parents ? He has now been four days in a state of complete blindness ! The doctors, whom I found assembled at the house, give some slight hope, but I do not think Halford [Sir Henry Halford, the King's Physician] holds any. What a tragedy ! "

Ferry Lane and the Kew Eyots.

Ferry Lane, or Meyer's Alley as it was long called, was probably little more than a track or right of way, connecting Kew Green with the towing path, until about 1823, when it was made into a proper carriage way by the Commissioners of Woods and Forests. At the Records Office, Chancery Lane, there is an agreement, dated 7th September 1823 (Ref. *Works* 16.31.2), by which Timothy Tyrrell (of the Guildhall, London) and Elizabeth Crutchley, who owned the small meadow through which the lane passed, agreed to relinquish all right to the strip of land constituting the lane on its being made into an improved public way, provided a boundary wall similar to an adjoining one be erected. Doubtless the wall then erected is the same wall that exists at the present day, having been altered or rebuilt in places. At about this time special funds (£650) had been provided " for making up an embankment as a carriage road and towing path by the side of the River Thames at Kew ". This was no doubt necessary as a result of the closing of the direct road to the Palace across Kew Green by George IV already referred to.

A landing stage " Hunter's Wharf " existed near the northern end of Ferry Lane at one time. Robert Hunter also had an interest in one of the Kew eyots (the lower one—then known as " Twig Eyot " or "Makenshaw island") which was later acquired by the Crown. According to old documents at the Records Office (Ref. *Works* 19.17.2) the Kew eyots seem to have been the cause of a good deal of contention at about this time. In 1830 a petition from the inhabitants of Brentford, with 28 signatures, was sent to the King asking that the osiers on the lower island be cut back, as they were with the former owner, for their growth prevented free circulation of air and encouraged the use of the island as a resort for thieves and for improper practices. The official reply was to the effect that it was desirable to have tree growth on the eyots in order to screen the ugliness of Brentford from Kew. At that time there was a cottage on the lower eyot occupied by a garden labourer, John Farr, said to be employed at Kew Gardens. It was recommended that a similar cottage be built on the upper eyot " to be occupied also by a respectable married man " and " charged to warn off all strangers attempting to land on the eyot ". It was also recommended that the site of the proposed cottage be raised 4–5 feet to allow of spring tides and that " the oziers be thinned out to form a central pathway from end to end for convenience of perambulation and circulation of air ". The recommendations do not appear to have been carried out, or the cottage on the upper eyot erected.

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Hardy Trees and Shrubs*—Few books on gardening can have met with such popularity as W. J. Bean's " Trees & Shrubs hardy in the British Isles ". Scarcely a week goes by without reference to it in the gardening press as an ultimate authority in all matters relating to trees and shrubs. It is, in fact, a veritable horticultural " bible ". It is a popularity that is well founded, not that a few motes cannot be found in the wisdom set forth in its pages. Everywhere plant lovers will welcome the first volume of the seventh edition, which its venerable author completed shortly before his death.

This edition is more than a reprint, as recent introductions and tender species, formerly included in the third volume, are now correctly placed in the alphabetical sequence. A few additional species also have been added. An unwelcome innovation is the placing of the photographic plates in one block at the end of the volume, instead, as hitherto, of interlarding them at appropriate places within the text. The botanical nomenclature is not invariably in accordance with the international rules, although the correct name is usually given as a synonym. There are a few errors such as mention of " four following " species of *Abies* (p. 118) where five are described, but these are only the motes referred to above. Until the remaining volumes are published, it is a convenience to have the temporary index for the first volume, but it is hoped that the appearance of the other two will not be long delayed.

R.M.

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*Trees & Shrubs Hardy in the British Isles : by W. J. Bean, Vol. 1, A-E, pp. xviii + 703, tt. 40 : London, John Murray 1950, price 42/-.

STIPA HOOKERI STAPF.

N. L. Bor.

Stipa hookeri *Stapf* (sect. *Lasiagrostis*) was published by the late Dr. O. Stapf in the Journal of the Linnean Society, **30,** 120 (1894). The specimen upon which this name was based is Thorold's no. 124 from Central Tibet and the type sheet is at Kew. The label reads " Thibet July-Septr. 1891. Coll. Surg. Captn. W. G. Thorold. No. 124. 14800 ft. Sheltered nullahs near water ".

Stapf's description of the panicle and spikelet is reproduced here. " *Panicula* angusta, subcontracta, 4–6 poll. longa, ramulis pedicellisque brevissimis ad 1 lin. longis, asperulis. *Glumae vacuae* subaequilongae, lanceolatae, acutae, tenues, 3–3½ lin. longae, glabrae ; fertilis lanceolata, vix 3 lin. longa, apice ad 1/3 bifida, lobis setaceo-acuminatis, inter eos aristata, 7-nervis, tota longe et patule pilosa, arista vix torta, geniculata, asperula, 4–5 lin. longa ".

The description of *S. hookeri* Stapf in the Flor. Brit. Ind. **7,** 232 (1896) differs from that of Stapf in the important respect that no reference whatever is made to the long setaceous lobes at the top of the lemma. These setae are firm and hard and represent the fusion of the two lateral nerves on either side which are carried out as two firm, sharp, scabrid points. This suggests that Hooker based the description in the Flor. Brit. Ind. partly, at least, on some other plant. Hooker quotes the following sheets from India as representing *S. hookeri* Stapf.

(1) Western Tibet ; in wet places, alt. 10–14000 ft., *Jacquemont.*

(2) Nubra, Thomson.

(3) Tibetan Sikkim, alt. 15–16000 ft., J.D.H.

Taking no. 3 first, it may be said at once that this matches Thorold's sheet in every respect and is therefore *Stipa hookeri* Stapf. Nos. 1 & 2 represent a species which differs from *Stipa hookeri* Stapf in the very effuse panicles, smaller spikelets, in the tip of the lemma being 2-lobed but not 2-aristate, and in the finer texture of the glumes. It is very obvious that Sir Joseph Hooker drew up from one of these sheets the description which appears in the Flora of British India., The grass on these sheets appears to be *Stipa splendens* Trin. et Spreng., Neue Entdeck. **2,** 54 (1821).

This is, however, not the only complication. In the Journal of the Washington Academy of Sciences **23,** 134 (1933), Hitchcock described a new species of *Timouria* to which he gave the name *Timouria aurita* Hitch. This grass, *Koelz* no. 2328, was collected in sand at Kugzil, Rupshu, Kashmir, at about 4300 metres on the 16 July 1931. It differs in no respect from Thorold's specimen upon which Stapf based *Stipa Hookeri* and the name *Timouria aurita* must therefore be relegated to the synonymy of this species.

An amended and extended description of *Stipa Hookeri* Stapf follows.

Stipa hookeri *Stapf* in Jour. Linn. Soc. **30,** 120 (1894). Syn. *Timouria aurita* Hitch. in Jour. Wash. Acad. Sc. **23,** 134 (1933).

A perennial grass with thick roots and rhizomes covered with overlapping, coriaceous, shining, glabrous, striate cataphylls. *Culms* up to

70 cm. tall, clothed at the base with the leathery remains of old sheaths, smooth or minutely scaberulous, glabrous ; innovations intravaginal. *Leaf-blades* strongly involute, setaceous, opening in old age and flattening out, linear, tapering to a firm setaceous point, pale green or glaucous in colour, 10–35 cm. long, 5 mm. wide, minutely scaberulous on the upper surface, rough on the margins, smooth below ; *sheaths* of the culm longer than the internodes, overlapping, clasping, minutely retrorsely scabrid, striate, glabrous, the lower and those of the innovation shoots very loose, flattening out, leathery, shining, markedly striate, persistent ; *ligule* short, membranous to chartaceous, about 2 mm. long, irregularly lacerate at the top, minutely ciliate on the teeth.

Inflorescence a narrow, pale, purplish panicle the lower part of which is frequently enclosed in the mouth of the uppermost leafsheath, up to 16 cm. long, by 3 cm. broad, seated on a minutely scabrid and glabrous peduncle; branches slender, ascending, naked in the lower half, branching and re-branching, scaberulous ; lateral pedicels very short, scabrid. *Spikelets* gaping at anthesis, purplish, crowded, about 8 mm. long. *Lower glume* 8 mm. long, 2–2·5 mm. wide, elliptic or elliptic lanceolate in shape when flattened, acute, 3-nerved, rounded on the back below, compressed and keeled above, glabrous, minutely scabrid all over the dorsal surface, scabrid on the keel ; *upper glume* 7·5 mm. long, 1·75–2 mm. wide, narrowly elliptic-acute when flattened, 3-nerved, minutely scabrid all over the dorsal surface, rounded on the back below, keeled and compressed above ; rhachilla disarticulating above the glumes. *Lemma* seated on a short oblique callus which is glabrous, curved round the palea, 8·5 mm. long (including the bristles 3–4 mm. long) 1 mm. wide, oblong when flattened, 5–7-nerved, the two lateral nerves anastomising at the top and carried out as two scabrid bristles 3–4 mm. long, covered all over the back with colourless hairs up to 2 mm. long ; awn from the sinus 14–15 mm. long, scabrid, not twisted at the base ; *palea* clasping the stamens, narrowly elliptic-acute, 6·5–7 mm. long, 2-nerved, covered on the dorsal surface with numerous long colourless hairs ; *stamens* 3 ; *anthers* 4–4·5 mm. long, each cell produced into a minute naked horn ; *styles* 2, very short ; *stigmas* plumose ; *lodicules* 3, oblong-acute, 1·5mm. long.

INDIA: Kashmir, Kugzil, Rupshu, 4300 m., 16 Jul. 1931, *Koelz* 2328. TIBET. Probably in the vicinity of Lhasa. July–Sept. 1891, *Thorold* 124 ; East Tibet 16000 ft., 20 Jul. 1905, *Younghusband* 113 ; Tinkye Plain, Mt. Everest Expedition, 16 July 1933, *E. O. Shebbeare* 104.

The wider question whether the so-called *Stipa hookeri* Stapf actually is a *Stipa* or not is one which must be deferred to a later date. At any rate the section *Lasiagrostis* of *Stipa* in which *Stipa hookeri* Stapf was placed by Hook. f. is considered by Nevski (Act. Inst. Bot. Acad. Sci. 4, 224 : 1937) to be so different from *Stipa* proper that he has removed it from that genus and placed some of the species in the section in the genus *Achnatherum* P. Beauv. (*Lasiagrostis* Link). This genus, while its relationship with *Stipa* is obvious, he believes to be more primitive on account of the simple awn and unindurated lemma. The structure of the spikelet of *Stipa Hookeri* seems to be different from that of both *Stipa* and *Achnatherum* and it is probable that further research will indicate that its relationships lie elsewhere.

LENTINUS IN TRINIDAD B.W.I.

R. W. G. DENNIS.

Species of Lentinus are very widespread in the tropics where, because of their tough consistency, they were among the few agarics collected in the last century and named by the early European mycologists. Consequently a great many species have been described from inadequate material and mycologists working in the tropics find great difficulty in assigning names to their familiar species. The present note aims at clarifying the conception of some of the common West Indian species but it will be understood that only a mycologist resident in the country can form a critical opinion on specific limits in these somewhat variable fungi.

The Lentini of Trinidad may be divided conveniently into two groups, those with a hairy pileus and those with a smooth pileus. The former belong to two fairly well-defined series : (a) With adpressed rope-like hairs on the pileus, including *L. crinitus* and a number of allied species, varieties or growth forms. (b) With short erect hairs forming a close velvety pile on pileus and stipe alike, including *L. velutinus*, *L. strigosus* and their allies. The members of this series are all mauve when young whereas those of series (a) seem to be always white or brown from the first.

The members of this hairy group have curious thick-walled cystidia protruding from their gills, arising directly from tramal elements which have pierced the hymenium.

On the above basis the Trinidad species known at present may be keyed out as follows :—

I Pileus more or less hairy.

A. Pileus surface formed of radiating hyphae whose ends become free and cohere in long, loose, rope-like strands. Gills slightly anastomosing at the base and papillate with minute hyphal pegs.

a. Pileus sparsely hairy except towards the margin, hairs rope-like, not cohering in squamules :

Pileus about 2 inches across, stipe smooth or with a fine brown felted surface . . . . *L. crinitus*

Pileus up to 1 inch, less deeply infundibuliform *L. bertierii*

b. Pileus densely hairy throughout, hairs more erect, often of single hyphae tending to cohere in pointed squamules, Stipe similarly hairy . . . . *L. nicotianus*

B. Pileus covered with a pile of short erect hairs formed of single hyphae, gills not anastomosing at the base, whole sporophore at first mauve, soon turning brown.

a. Stipe short and usually excentric . . . . *L. strigosus*

b. Stipe long and central:

1. Gills broad, stipe long and stout, typically attached to buried wood . . . . *L. velutinus*
2. Gills narrow, stipe more slender, often tufted, on logs. *L. velutinus* var. *leprieurii*

II Pileus smooth, white or cream coloured.

A. Gills conspicuously dotted with protruding hyphal pegs *L. nigro-osseus*

B. Gills without hyphal pegs or cystidia
  a. Without a universal veil
    1. Small species with more or less hemispherical pileus, becoming umbilicate with age . . . *L. detonsus*
    2. Large species with lobed pileus and excentric or lateral stipe . . . . *L. calvescens*
  b. With a universal veil, retained as a specialised cuticle on the pileus, long-stalked and caespitose *Lentodiellum concavum*

Lentinus *Fr.*

Syst. Orb. Veg. 77 (1825).

Type species *Agaricus crinitus* L. ex Fr.

1. *Lentinus crinitus* (L. ex Fr.) Fr., Syst. Orb. Veg., 77 (1825).
Agaricus crinitus L. ex Fr., Syst. Myc. **1,** 175 (1821).
L. villosus Klotzsch, Linnaea **8,** 479 (1833).
L. leveillei Berk. in Trans. Linn. Soc. London **20,** 112 (1851).
L. schomburgkii Berk. in Trans. Linn. Soc. London, **20,** 111 (1851).
L. wrightii Berk. & Curt. in Journ. Linn. Soc. London, **10,** 300 (1869).
L. rigidulus Berk. & Curt. in Journ. Linn. Soc. London, **10,** 301 (1869).
L. subcervinus Berk. & Curt. in Journ. Linn. Soc. London, **10,** 301 (1869).

Pileus up to about two inches across, deeply infundibuliform, the margin curved downwards and at first inrolled, surface white, drying reddish-brown and shining, marked by parallel strands of darker radiating hyphae whose ends become free as long loose brown hairs, formed of numerous parallel, coherent hyphae. Flesh thin, tough, white. Gills deeply decurrent, narrow, crowded, interconnected at the base in a short network like that of *Paxillus involutus*, well figured by Berkeley (1851, t. 9), white, drying light brown, edge almost entire, surface dotted with short pegs composed of coherent, thick walled hyphae. Stipe central, usually about one inch long, 1/8 – 1/4 inch thick, surface rather downy-fibrillose, not scaly or velvety, equal, solid. Tramal hyphae about 4μ wide with thick hyaline walls and fine lumen, lying both vertically and longitudinally in the gills, the pileus cuticle not differentiated from the trama. Spores not seen. On dead wood.

Specimens examined :

Trinidad : H. Caracciola 12.v.1910 ; River Estate, Diego Martin, 13.1.1921, *E. M. Wakefield* ; 24th–26th mile post on Long Stretch, 16.III.1928, *W. E. Broadway* 6798 ; St. Augustine 27.VII.1947, *R. E. D. Baker* 1529 ; Bacolet Valley 23.VIII.1947, *W. T. Dale* 1596.

British Guiana : Moraballi Creek, Essequibo River, 16.X.1929, *E. B. Martyn* 590.

French Guiana : Specimen from Leveillé in Herb. Berk. as *L. schomburgkii*.

Brazil : San Carlos del Rio Negro, April 1853, *Spruce* 128 : Minas Geraes, *C. Torrend*, Nov. 1913 ; unlocalised, Herb. Hook.

Ecuador : E. Andrée, Herb. Am. Æquinoct. 4597.

Peru : Peruvian Andes, *Pearce*, Herb. Cooke.

Costa Rica : Örsted in Herb. Fries, Uppsala.

Nicaragua : Herb. Hook.

Mexico : ex Herb. Paris in Herb. Cooke.

Dominica : North end Windward forest, 23.VII.1888.

Martinique or Guadeloupe : Husnot, Pl. des Ant. Nos. 589 & 589b (1868).
Montserrat : on *Tecoma leucoxylon, South* 114.
San Domingo : Herb. Berk. No. 4 as *L. schomburgkii.*
Jamaica : Brown, History of Jamaica tab 15, fig. 1.
Cuba : Wright 179 (type of *L. wrightii*) ; 175 (type of *L. rigidulus*) ; 177 (type of *L. subcervinus*) ; 68 ; 69 ; 178 ; 181 ; Fungi cubenses wrightiani 143, 144, 146, 149, 150.
Florida : *J. B. Ellis*, Herb. Cooke, 3991 ; *Ellis and Everhard*, N. Am. Fung. Ser. II, 1600, winter of 1885 ; Hogtown Creek, Alabama Co., *R. Singer*, Reliquiæ Farlowianæ 982.

The following are a dark brown very densely hairy form with tightly inrolled margin which may possibly be distinguished as *L. fumigatus* Lév. 1846, but which in absence of field evidence I prefer to regard as a juvenile state :

French Guiana : authentic material of *L. fumigatus.*
Brazil : Panuré, *Spruce* 129, Herb. Berk : Minas, Oct. 1840, *Gardner*, Herb. Hook. ; Rio Janeiro, Mr. Fry's garden, 6.VIII.1826, Herb. Berk. ex Burchell herbarium ; Bahia, Challenger, Herb. Berk. ; unlocalised specimen in Herb. Berk. ex Herb. Hook. labelled *L. berterii*, later corrected to *L. villosus.*
Cuba : Herb. Hook. ; *C. Wright* 71, Herb. Berk. as *L. stuppeus* Kl.
Cayman Is. : East end Cayman I., on mahogany 15.XII. 1945, *C. B. Lewis* 7.

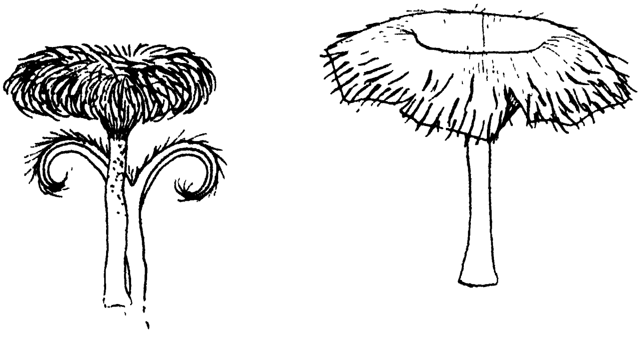

Fig. 1. *Lentinus crinitus*, left ; juvenile specimen from Cayman Is. ; right ; sketch of the Linnaean specimen, Linn. 1279.1.

L. crinitus varies greatly in number and density of hairs and there has been a tendency to call the smoother forms *L. crinitus* and the hairier *L. villosus.* There is a complete intergrading series and the two cannot be separated in herbarium material. *L. villosus* was described from Mauritius and the type at Kew is not remarkably hairy. If a name is required for the very shaggy forms from tropical America it will be better to revive *L. fumigatus* Lév. *L. stuppeus* Klotzsch is a dark, almost black, form with shaggy pileus and stipe bristly, at least at the base, which is not matched among the American material at Kew. It was described from Mauritius and collections comparable with the type have been received from tropical Africa.

L. nigripes Fr. is another probable synonym of *L. crinitus*, as shown by Fries specimen under that name at Uppsala. The name was, however, published by Klotzsch who cited as type a specimen from " Ins. Maurit. Telfair, Hb. Hook.". There appears to have been some confusion as the only relevant specimen from Telfair in Herb. Hooker has been labelled by Klotzsch himself *L. villosus*, a species published on the same page as *L. nigripes*. *Agaricus essequeboensis* Meyer ex Fr. 1821, may be *L. crinitus* but I have been unable to ascertain if the type still exists at Gottingen.

2. *Lentinus bertierii* (Fr.) Fr., Syst. Orb. Veg. 77 (1825).

Agaricus crinitus Bertier apud Sprengel in Kongl. Vet. Acad. Handlingar, 50 (1820).

Agaricus bertierii Fr. Syst. Myc. **1,** 175 (1821).

L. crinitus (L. ex Fr.) Fr. var. *bertierii* Pilat in Ann. Mycol. **34,** 110 (1936).

Pileus up to one inch across, deeply umbilicate, light yellowish, becoming yellowish brown with age, the surface smooth and dotted with small blackish-brown pointed squamules, more or less adpressed but free at the tips. Flesh thin, white, tough. Gills crowded, narrow, decurrent, anastomosed at the base, cream coloured, edge denticulate, surface dotted with minute papillae scarcely visible under a hand lens, formed of several parallel, coherent, thick-walled hyphae. Stipe short, 1/8–1/4 inch thick, solid, covered with brown or blackish scurfy down. Tramal hyphae thick-walled, hyaline 4–5µ wide, cuticle of pileus about 15µ thick, formed of compact thinner-walled hyphae. Spore print pure white, spores hyaline, non-amyloid, cylindrical, 5–7 × 1·5µ. Basidia cylindric-clavate, 18 × 3µ, 4 spored. In clusters on dead wood. Specimens seen :—

Guadeloupe : Type, Sprengel in Herb. Fries, Uppsala.

Trinidad : on dead *Cocos* trunk, Cocal, 22.XI.1949, *Dennis* 352.

Nicaragua : C. Wright, Herb. U.S. North Pacific Exploring Expedition.

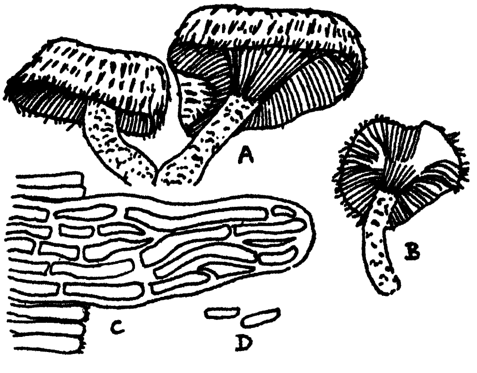

Fig. 2. *Lentinus bertierii* (a) Dennis 352 from fresh material.
(b) sketch of the type in Herb. Fries, Uppsala.
(c) Section of hymenial peg × 650.
(d) Spores × 650.

Cuba : Fungi cubenses wrightiani 145.

Jamaica : Corn Puss Gap, St. Thomas, *Amy Barry* F 69, 25.IV.1946.

Dominica : Clark Hall, 15.XI.1920, *E. M. Wakefield.*

The Dominica collection exactly matches the type, the others are a little larger but are, I think, referable to the same species. The Nicaraguan and Cuban collections cited were determined by Berkeley as *L. tener* Klotzsch apud Fries 1836 but the type of that species, stated to be ex Herb. Hooker, is not represented at Kew and its interpretation remains uncertain. Another similar form is *L. swartzii* Berk. of which the type, from Jamaica, can no longer be traced at South Kensington. *L. ravenelii* Berk. & Curt. is superficially somewhat similar but has a softer texture and lacks the hymenial glands. The Trinidad form with dark squamules resembles *L. tigrinus* (Bull. ex Fr.) Fr. but has small spores. This may be what Pilat (1936) regards as the tropical form of that plant, under the name *L. tigrinus* var. *holopogonius* (Berk.) Pilat but it is not *L. holopogonius* Berk.

Teixeira (1946) has well figured *L. bertierii* from Sao Paulo, Brazil, under the name *L. crinitus.*

3. *Lentinus nicotianus* Berk. Hooker's Kew Journ. Bot. **8,** 141 (1856).

Pileus one to two inches across, hemispherical, then more or less flattened with a small umbilicus, surface covered with dark brown, more or less erect, thick walled hairs, tending to run together into rope-like strands which cohere at their tips to form pointed squamules. Flesh white, tough. Gills crowded decurrent, not anastomosed at the base but gradually dying out amongst the hairs of the stipe, edge denticulate, surface white or pale lilaceous, dotted with short, glandular hyphal pegs which are often capped by an irregular mass of crystals. Stipe central, about 1/8–1/4 inch thick, solid, clothed with short brown, downy hairs. Tramal hyphae about 4μ diameter with thick hyaline walls, undulating but lying more or less parallel and vertical in the gills. There is no cuticle to the pileus and the squamule hairs arise directly by outgrowth of the tramal hyphae. Spores cylindrical, hyaline, non-amyloid, $7–8 \times 2–2{\cdot}5\mu$.

The pileus surface dries dark grey-brown and in the type the squamules assumed a yellowish-brown tint like that of pipe tobacco, hence the specific epithet. Gregarious on dead wood.

Specimens examined :

Brazil : Panuré, January, *Spruce* 45 (Type).

British Guiana : April 1887, *Jenman* 3792.

Trinidad : H. Caracciola No. 17, May 1910 ; St. Augustine, 28.V.1947, *R. E. D. Baker* 1441.

Teixeira (1946) has well figured this species under the name *L. villosus.*

4. *Lentinus velutinus* Fr. Linnaea **5,** 510 (1830).

Lentinus blepharodes Berk. & Curt. Journ. Linn. Soc. London **10,** 301 (1869).

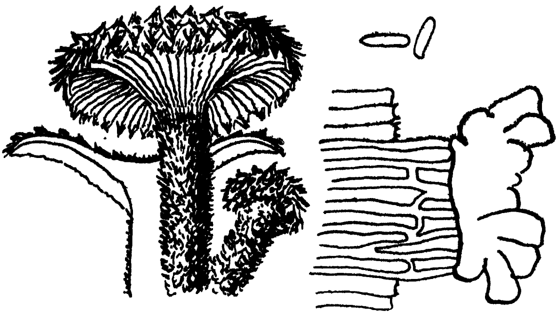

Fig. 3. *Lentinus nicotianus* from fresh material, of Baker 1441. Hymenial peg and spores × 650.

Pileus deeply infundibuliform, becoming flattened with a centra umbilicus, up to four inches across, surface densely clothed with short erect, cinnamon-brown hairs, which sometimes cohere slightly to form loose conical tufts, closely striate where the pile is eroded, margin shortly ciliate. Flesh thin, tough. Gills rather crowded, deeply decurrent, not anastomosed at the base but disappearing under the pile on the stipe, edge even, concolorous with the pileus, devoid of glands or hyphal pegs. Stipe central, long, cylindrical, about 1/4 inch thick, solid, completely clothed with short, erect hairs like those of the pileus. Spores not seen, but Teixiera found them to be 6–7 × 2·5–3μ. On roots of trees and buried wood in forests.

Specimens examined :

Brazil : Type in Herb. Fries, Uppsala ; unlocalised from Gardner, Herb. Berk. ; Teixiera has figured the species from Sao Paulo.

Paraguay : Guarapi 1880, Balansa Pl. du Paraguay 3367.

British Guiana : Demerara 1884, Herb. Cooke.

Central America : Herb. Hooker.

Costa Rica : Los Concavas, 4700 ft. Dec. 1925, & 1929, *C. H. Lankester.*

Cuba : *Wright* 66, 157, Herb. Berk. ; *Wright* 169 n Herb. Berk. as *L. nepalensis* Berk. ; *Wright* 72, 75, 170, 171 as *L. blepharodes* Berk. & Curt.

The name *L. blepharodes* Berk. & Curt. applies to forms in which the pileus is broad and flattened with a less dense coating of hairs. These are here regarded as an expanded state of *L. velutinus* with which they otherwise agree, but this conception should be checked by observation of the living plants. A Trinidad collection of the typical form is not yet to hand but the following variety may prove to be no more than a growth form occurring on logs above ground.

var. *leprieurii* (Mont.) comb. nov. *Lentinus leprieurii* Mont. in Ann. Sci. Nat. Ser. 4, **1,** 119 (1854).

Differs from the type in its smaller size and narrower obtuse gills. The fungus is at first bright mauve throughout, soon turning cinnamon brown, the flesh white. Tramal hyphae are about 3μ diameter with thick hyaline walls and run both vertically and longitudinally in the gills.

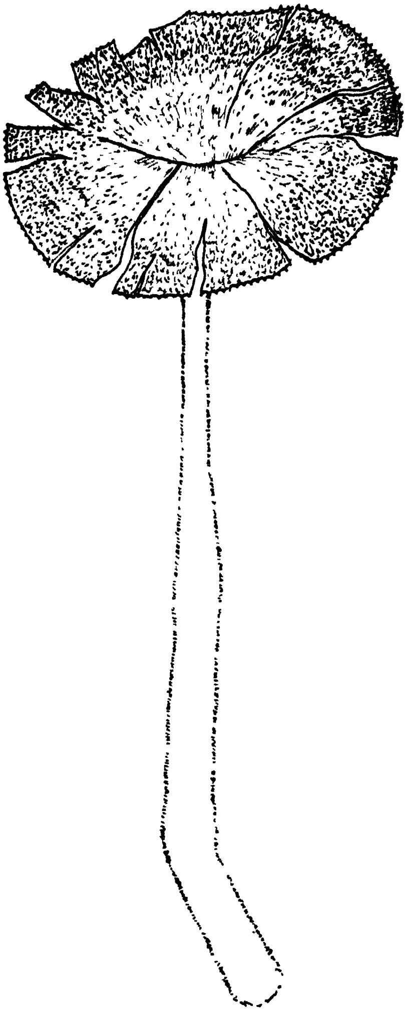

Fig. 4. *Lentinus velutinus* sketch of the type specimen in Herb. Fries, Uppsala.

Those of the pileus surface are more compact but there is no distinct cuticle. The hairs are formed of single, brown, thickwalled hyphae, about 5µ diameter. There are no hyphal pegs or glands on the gills but a few tramal hyphae turn outwards and penetrate the hymenium as short, colourless, more or less pointed cystidia. No spores were found though freshly collected mauve and brown sporophores of Dennis 182 were left overnight under conditions in which *L. bertierii* and *Marasmius* spp. spored freely.

On dead wood, arising from white mycelium below the bark.

Trinidad : In swarms on Mora logs and chips, Valencia forest, 16.X. 1949, *Dennis* 182.

British Guiana : *Jenman* 3791, April 1887.

French Guiana : ad ligna combusta in carbonariis Guyana, authentic material from Montagne in Herb. Berk. ; Cayenne, Herb. Berk.

Brazil : *Sallé* 129, Herb. Berk. ; Manaos, Amazonas, 1900, Ule, Myc. Bras. 49 b.

Peru : Leticia 1902, Ule, Myc. Bras. 49a.

Jamaica : Purdie, Herb. Hook. as *L. fulvus* Berk.

Cuba : *Wright* 183 ; *Wright* 182, the type of *L. siparius* Berk. & Curt. may probably also be this fungus.

Florida : Gainsville, Florida, Ravenel, Fungi Amer. Exs. 104.

It may be this that Teixiera (1946) described under the name *L. similis* Berk.

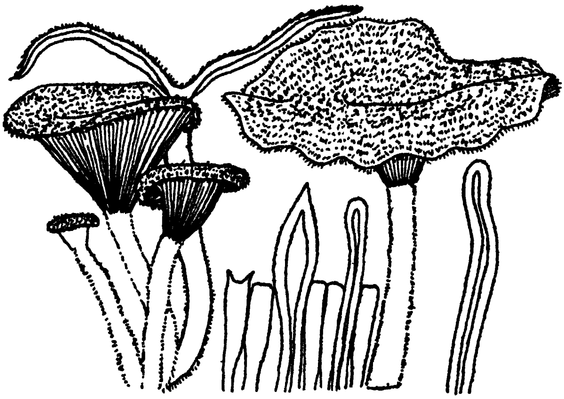

Fig. 5. *Lentinus velutinus* var. *leprieurii*, from fresh material of Dennis 182. Section of hymenium showing cystidia and hair from pileus × 650.

5. *Lentinus strigosus* (Schwein.) Fr. Syst. Orb. Veg., 77 (1825).

Agaricus (*Pleuropus*) *strigosus* Schwein. Syn. Fung. Carol. Sup., 63 (1822).

Pileus up to two inches across, irregular, more or less deeply umbilicate, at first violaceous, drying pale buff, surface finely tomentose with more or less erect, short, fine, tufted hairs. Gills crowded, deeply decurrent, concolorous, minutely papillate under a lens owing to the presence of both cylindrical, more or less pointed, thick-walled cystidia about 30 × 3–7μ and short hyphal pegs almost 30 × 15μ, formed of parallel, thick-walled hyphae. Stipe short, excentric, 1/8–1/4 inch thick, solid, concolorous with the pileus and clothed with similar downy hairs. Trama of hyaline, thickwalled hyphae 4μ diameter, mostly lying longitudinally in the gills, intermixed with a few thinwalled hyphae ; cuticular layer of compact hyphae somewhat disorganised in dried material. Hairs up to 200 × 5–7μ with thick, hyaline walls.

On trunks, posts and rotting wood.

Specimens examined :

Trinidad : 23rd-24th mile posts on Long Stretch, 18.V.1928, *W. E. Broadway* 6948.

French Guiana : material from Leprieur.

Brazil : Panuré, March 1853, *Spruce* 135 ; unlocalised, *Sallé* 263, Herb. Berk. ; Arrial des Merces, Minas Geraes, Oct. 1840, *Gardner*.

San Domingo : *Sallé* 3, Herb. Berk.

Cuba : *C. Wright* 77, 78.

Florida : Sept.–Oct. 1888, Roumeguère Fungi Sel. Exsic. 4804.

Georgia : Darien, *Ravenel* 2511.

S. Carolina : Aiken, *Ravenel* 207 and *de Thumen*, Myc. Univ. 603.

N. Carolina : Authentic material from Schweinitz in Herb. Fries, Uppsala.

Ohio : Amanda, July 1883, *Rabenhorst–Winter* 2940.

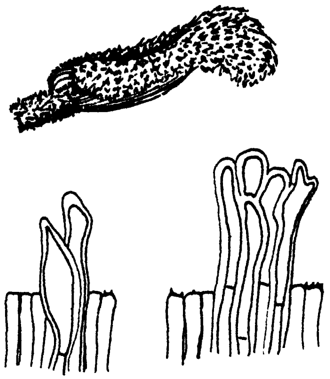

Fig. 6. *Lentinus strigosus* sketched from dried material, of Broadway 6948. Sections of hymenium with cystidia × 650.

Also sporadically in south and central Europe according to Pilat (1935). Lloyd (1917 p. 7) attempted to distinguish the West Indian form from that found in the United States as being more fleshy and putrescent, and called it *L. guaraniticus* Speg. *L. lecomtii* Fr. 1828 is probably synonymous but the type is not now to be found at Uppsala. Pilat (1935) referred *L. strigosus* to *Pleurotus* under the name *P. rudis* (Fr.) Pilat but its affinities seem clearly with *L. velutinus* and the epithet *rudis* dates only from *Panus rudis* Fr. 1838. Fries (1836) has both *L. strigosus* Schwein. and *L. strigosus* Pers. The latter is, however, an error, presumably by the printer, for *L. strigopus* (Pers.) Fr., based on *Agaricus strigopus* Pers., described and figured in 1826 from Rawak I., off the north coast of New Guinea. Fries changed the name, apparently unnecessarily, to *L. capronatus* Fr. in 1838. Burmese specimens under this name in Herb. Currey closely resemble Persoon's figure of *L. strigopus* and are evidently allied to *L. velutinus*. *Lentinus strigellus* Berk. 1869 = *L. sparsibarbis* Berk. & Curt. 1869 = *Pleurotus* (*Lentinopanus*) *strigellus* (Berk.) Pilat 1936 is perhaps no more than a variety of *L. strigosus*, distinguished by its smooth umbilicate pileus with rather distant concentric zones of small tufted downy hairs, more plentiful towards the finely ciliate margin. There are collections of this species at Kew from Cuba, Peru and Mexico. In a specimen from Costa Rica, so named by Bresadola, Pilat found spores 4·5–5 × 2μ.

6. *Lentinus detonsus* Fr. in Acta R. Soc. Sci. Upsal. Ser. 3, **1,** 38 (1851).
Lentinus cubensis Berk. & Curt. in J. Linn. Soc. London **10,** 302 (1869).
Lentinus proximus Berk. & Curt. in J. Linn. Soc. London **10,** 302 (1869).
Lentinula cubensis (Berk. & Curt.) Earle in Bull. N.Y. Bot. Gard. **5,** 417 (1909).

Lentinula detonsa (Fr.) Murrill in Mycologia **3,** 28 (1911).

Pileus convex or slightly depressed at the disc, white, turning reddish brown in streaks and patches with age and decay, drying cream coloured or buff, one or two inches across, smooth, edge incurved. Flesh thick, white. Gills rather broad and crowded, almost free, white, turning dark reddish brown with age. Stipe at first central, becoming excentric or occasionally lateral, short, curved, white, fibrillose or subsquamulose, about 1/8 inch thick, solid. Trama of fairly thinwalled hyphae about 8–10μ diameter, with clamp connections, lying parallel and vertical in the gills, loosely woven with large air spaces in the flesh of the pileus. Cuticle well developed, about 15μ thick, of thin-walled closely woven hyphae 4–5μ diameter. Cystidia absent. Spores elliptic-cylindric, hyaline, non-amyloid, 5–6 × 2–2·5μ.

In swarms on dead wood, often erumpent through the bark.

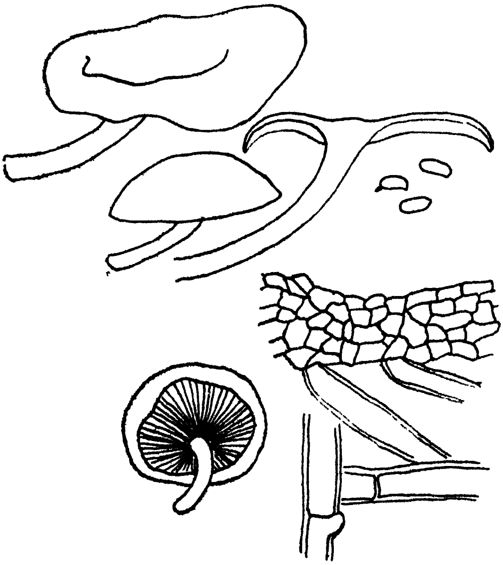

Fig. 7. *Lentinus detonsus.* Above : Dennis 329 from fresh material. Below : dried specimen showing the incurved margin natural size and section of pileus cuticle × 650.

Specimens examined :

Trinidad : Morne Bleu 27.1.1921, *E. M. Wakefield* 337 ; Caura Valley 11.XI.1949, *Dennis* 329 ; Maracas Waterfall 25.X.1949, *Dennis* 329A.

Cuba : *Wright* 115 (type of *L. cubensis*), 80 ; 112 ; Fungi cubenses wrightiana 161 ; *Wright* 27, 117 and F. cub. Wr. 162 as *L. proximus.*

Though I have not seen the type of *L. detonsus* Fr., which is not at Uppsala, the description agrees well with the above and I see no reason to dissent from the synonymy already proposed by Murrill and Pilat.

L. cubensis is the type species of *Lentinula* Earle, but Singer (1942) considers that in essential characters it cannot be separated from *Lentinus.*

7. *Lentinus calvescens* Berk. in Hooker's Journ. Bot. **8,** 141 (1856).
Pleurotus jacksoni Berk. & Cooke in J. Linn. Soc. Bot. **15,** 367 (1877).

Pileus very large, irregularly lobed, up to six inches across, flat, somewhat depressed at the centre and arched at the margin, smooth, white, drying buff and then finely striated. Flesh rather thick, white, soft. Gills broad, distant, thin, decurrent, margin entire, surface smooth, cream coloured. Stipe short, central, becoming excentric, equal or slightly enlarged at the base, up to 1/2 inch thick, smooth, solid, white. Tramal hyphae 5–6μ diameter, with thick hyaline walls and a narrow lumen, running vertically and longitudinally in the gills, cuticle thin, compact, of closely woven, thin-walled hyphae, somewhat disorganised in dried material. Cystidia absent. Spore print cream coloured, spores hyaline, non-amyloid, cylindrical or slightly curved, 6–8 × 1·5–2·25μ.

More or less caespitose on dead wood.

Specimens examined :

Trinidad : 22nd–24th mile post on Long Stretch, 18.V.1928, *W. E. Broadway* 6847 ; Botanic Gardens, Port of Spain 1894, 5890 ; St. Augustine 20.VIII.1947, *R. E. D. Baker* 1545.

British Guiana : Essequibo opposite Bartica, Nov. 1886, *Jenman* 2468.

Brazil : Panuré Feb. 1853, *Spruce* 136 (Type) ; Mauhes, Trail 125 (type of *P. jacksoni*).

Barbados : *F. Watts*, Nov. 1910 ; on *Tecoma leucoxylon*, Farley Hall, 26.IX.1920, *E. M. Wakefield* 8.

Dominica : North end Windward forest 31.VIII.1888.

Jamaica : *R. E. Osborne*, June 1948.

It is noteworthy that apart from the Brazilian material named by Berkeley all the above collections are from British colonies. It seems likely that at other herbaria this conspicuous and common species passes under other names. Murrill (1916) cited thirteen synonyms, the oldest being *Agaricus hirtus* Fr. 1830 but in some points his synonymy is demonstrably wrong and for the present I adhere to the well authenticated name *L. calvescens* Berk.

8. *Lentinus nigro-osseus* Pilat in Ann. mycol. **34,** 122 (1936).

Pileus about one and a half inches diameter, convex with a shallow central umbilicus, surface smooth, white or cream coloured, sometimes with brownish striae at the centre, margins undulating, closely striate. Flesh thin, white, tough and fibrous. Gills crowded, narrow, white, decurrent, their edges finely denticulate, bearing on their faces numerous white hyphal pegs up to 125 × 27μ readily visible under a hand lens. Stipe central, slender, equal, undulating, smooth, yellowish brown, darker at the base, about 1/8 inch thick, solid. Trama homogeneous, of interwoven hyphae 4–5μ diameter with colourless walls 1–1·5μ thick. The hyphae of the hymenial pegs are rather thinwalled and their contents stain deeply in cotton blue. Cuticle of the pileus of parallel hyphae 4μ wide. Spore print white, spores cylindrical, 4–5 × 1·5μ.

On logs.

Specimens seen :

Trinidad : c. 2000′ on Mt. Aripo, 23.X.1949, *Dennis* 217.

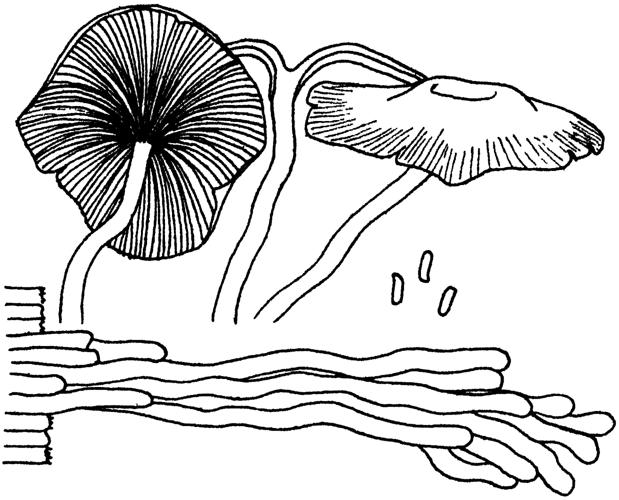

Fig. 8. *Lentinus nigro-osseus* from fresh material of Dennis 217. Below : Hymenial peg and spores × 650.

One feels there should be an older name for this well defined species. A collection from Point de Galle, Ceylon, named *Lentinus pergamenus* Lev. by Berkeley agrees tolerably but an authentic sporophore of that species labelled by Léveillé " L. pergamenus Lév. Java ? herb. de Candolle ", though macroscopically similar, lacks the hyphal pegs on the gills. Moreover that species was densely caespitose, which is not true of 217. *L. subnudus* Berk. seems to be a similar but stouter form. *L. subglaber* Lloyd from Brazil was described as having " short projecting hyaline hyphae " on the gills but the young pileus was rose coloured and the spores 5 × 3·5μ. *L. leucochrous* Lév. and *L. cladopus* Lév. are much like *L. pergamenus* but seem to differ from 217 in that the former has a bulbous stipe and the latter a branched stipe.

Pilat saw only dried material from Guadeloupe, which he described as " nigro-brunneo " and in referring the Trinidad collection to his species I am influenced especially by the abundant glandular hyphal pegs on the gills. He described them as " organa cystidiformia 60 × 20–30μ ex hyphis conglutinatis, quae glandulas stipitatas Phaneorgamorum nonnullarum in mentem revocant."

Lentodiellum *Murrill* in Mycologia **7,** 216 (1915).

9. *Lentodiellum concavum* (Berk.) Murrill in Mycologia **7,** 216 (1915).

Panus concavus Berk. in Ann. Mag. Nat. Hist. Ser. 2, **9,** 194 (1852).

Pileus one to two inches across, infundibuliform, smooth, white, margin incurved. Flesh thin, firm, white. Gills crowded, narrow, thin of several lengths, deeply decurrent, white, drying yellowish. Stipe long, equal, about 1/8 inch thick, solid, smooth, white, longitudinally furrowed when dried. Trama of thin-walled hyphae 4–5μ diameter. Cuticle of the pileus 20–25μ thick, of very slender hyphae with thick gelatinised walls. Basidia cylindrical, 3μ wide, four spored. Spore print white, spores cylindric-elliptic, non-amyloid, 5–7 × 2–2·5μ. There are no cystidia on the gill face but the gill edge is fringed with slightly clavate thinwalled hairs about 20× 4–5μ. Densely caespitose on decaying wood.

Specimens seen :

San Domingo : Herb. Berk. (Type).

Trinidad : on buried wood in a manure heap, St. Augustine, 9.II. 1950, *J. Wilson.*

Murrill founded the genus *Lentodiellum* on this species, which he regarded as akin to *Lentinus* but differing in possessing a veil. Structurally it differs also in its thinwalled hyphae and its affinities may be rather with *Clitocybe.*

I have to thank Professor Nannfeldt for lending the tropical American material of *Lentinus* in E. M. Fries' herbarium, including the types of *L. bertierii* and *L. velutinus*, and Miss E. M. Wakefield for kindly allowing me to use her own West Indian collections and for reading the manuscript.

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THE BOTANY OF BEECHEY'S VOYAGE.

In the Journal of Botany 31 : p. 298, B. Daydon Jackson assigns dates of publication to the various parts of Hooker and Arnott's " The Botany of Beechey's Voyage " with the exception of Part 6, pp. 241-268. This he did by reference to Pfeiffer's Nomenclator for the dates of the new genera, assuming that the dates given therein must have been gathered from some copy.

Regarding Part 6 Jackson stated that there was " no indication of date owing to the absence of any new genus ". Part 6 was, however, noticed in the Ann. Nat. Hist. vol. 1, p. 476 (Aug. 1838) where it is stated that the sixth part had been recently published. From this it appears that Part 6 appeared in 1838 before August.

H. S. MARSHALL.

Plant Diseases*:—This curious compilation is divided into 5 very unequal chapters, viz. an introduction, a list of garden chemicals used in U.S.A. and their methods of application, a classification of plant pathogenes, a list of plant diseases under headings from Anthracnose to Wilt and a list of Host plants with names of the diseases recorded on them. The classification of pathogenes is merely copied from standard manuals, the list of host plants and diseases is based on that already issued by Weiss in the Plant Disease Reporter. What then is the purpose of this new and very expensive volume? The primary problem in plant pathology is correct diagnosis but it is idle to supose that a gardener will correctly diagnose a plant disease by running down the list under the host in chapter 5 and checking back to the kind of disease in chapter 4. Indeed, on p. 406 the author admits as much and recommends seeking professional advice before acting on a diagnosis obtained from the book. (But why not seek the advice in the first place?) Whatever may be the circumstances favourable to the handbook in the United States it can certainly serve no useful purpose elsewhere.

Detailed criticism of the text is hardly called for but it may be well to remind the author that the latest new combination of a fungus name is not necessarily the best. Thus, *Pycnostysanus azaleae* (Peck) Mason March 1941 is to be preferred to *Briosia azaleae* (Peck) Dearness August 1941. But there is no real advantage in abandoning here the familiar name *Sporocybe azaleae* (Peck) Sacc. 1886. In popular books addressed to gardeners a considerable degree of conservatism and stability in nomenclature is desirable. For example it is unwise to accept uncritically all Whetzel's segregates from *Sclerotinia* unless and until they have become established mycological usage. But if there is to be this feverish pursuit of nomenclatorial novelties why ignore all those proposed outside the United States and retain, for example, *Pezizella oenotherae* (Cooke and Ellis) Sacc. 1889 against *Discohainesia oenotherae* (Cook & Ellis) Nannfeldt 1932 ? Adoption of the binomial system of nomenclature for viruses merely indicates a complete lack of appreciation of the virus problem. What, for example, is one to understand by *Marmor marginans* strawberry yellow edge virus ? Prentice (1948, 1949) has shown that yellow edge in Royal Sovereign may be produced by a combination of his viruses 1 and 2 or 2 and 3. To which of these three entities does the name *Marmor marginans* apply? Actually it means nothing at all but a diseased strawberry and the adoption of binomial names for symptom expressions is mere scientific charlatanism.

The book is illustrated with photographs of symptoms, which are usually good, and line drawings of pathogenes which set a new low standard even for pseudoscientific manuals. The worst published figures of an organism we have ever seen are the nematodes in fig. 59, in which one cannot tell head from tail. There is never any indication of the degree of magnification, even where these nematodes, actually shown × about 50 appear side by side with sketches of diseased leaves natural size.

R. W. G. DENNIS.

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*Plant Disease Handbook. Cynthia Westcott. Van Nostrand Co. Inc., New York, and Macmillan and Co. Limited., London, 1950, vii + 746 pp. $7.50 or £2 16.

TROPICAL AFRICAN PLANTS : XXI*

TURNERACEAE

Hyalocalyx setifer *Rolfe* in Journ. Linn. Soc. Bot. **21,** 258, t. VII (1884)—as *H. setiferus* ; Vatke in Abhandl. Naturw. Ver. Bremen **9,** 116 (1887) ; Gilg in Engl. & Prantl, Pflanzenfam., ed. 1, III, **6A,** 62 (1893)—as *H. setifer*, et ibid., ed. 2, **21,** 464 (1925) ; Perrier de la Bâthie in Arch. Bot., Bull. Mens. **4,** 7 (1930) ; Mildbraed in Notizbl. Bot. Gart. Berl. **13,** 282 (1936)—as *H. setiferus.*

Turnera setifera (Rolfe) Baill. in Bull. Soc. Linn. Paris **1,** 582 (1886).

Hyalocalyx Dalleizetti Capitaine in Bull. Herb. Boiss., sér. 2, **8,** 252, t. V (1908).

TANGANYIKA. Lindi District. In the neighbourhood of Lukuledi about 150 Km. west of Lindi, small isolated groups at the edges of fields and paths, 20 April 1935, *Schlieben* 6338 (in Brit. Mus. Herb.).

PORTUGUESE EAST AFRICA. Quelimane District. Lugela, Moebede Road ; common along parts of the roadside (close to granite outcrops), 6 April 1948, *Faulkner* K 234 :—flowers dark yellow.

Hyalocalyx setifer was described from material collected by Dr. Christian Rutenberg on the " small island of Nossi-bé " (or Nosy-Bé) off the north-west coast of Madagascar. The type specimen is, or was, in the possession of the Herbarium at Bremen, but a small portion, together with dissections, was retained by Rolfe, and is preserved in the Kew Herbarium. Vatke (1887) cites additional material (*Hildebrandt* 4124) from Imerina, on the eastern side of Madagascar, and Perrier de la Bâthie (1930) states that the plant is widespread all over the western regions of the island, but hitherto there would not appear to have been any records for it outside the Mascarene area. It was, on this account, a pleasant surprise to find excellent specimens of *Hyalocalyx setifer* amongst a collections of plants from Portuguese East Africa recently presented to Kew by Mrs. H. G. Faulkner. The habitat at first suggested that the plant might not be native in this area, but subsequent information received from the collector, and from M. Perrier de la Bâthie, leads to a very different conclusion. Mrs. Faulkner finds no reason to suspect the standing of the plant in Mozambique ; the specimens were found at the side of a forest road, in company with other small annuals, and at a long distance from any cultivation or huts. M. Perrier de la Bâthie, so far from suspecting the indigenousness of the African specimens, is of the opinion that the plant is a native of the African mainland, and an introduced weed in Madagascar, remarking (in litt.) : " Cette plante, largement répandue sur le versant occidental de l'île, n'a pas à Madagascar le comportement d'une espèce spontanée. Elle y est souvent messicale, et probablement introduie. Sa découverte à Mozambique confirme mes soupçons à ce sujet ".

A second species of *Hyalocalyx*, *H. Dalleizetti* Capitaine, is, according to Perrier de la Bâthie, indistinguishable from *H. setifer* Rolfe. With this conclusion we are in complete agreement ; the characters employed by Capitaine to distinguish his species are scarcely more than additions and amendments to those given by Rolfe for *H. setifer. H. Dalleizetti* is not mentioned by Gilg in Engler & Prantl's Pflanzenfamilien ed. 2, nor by Lemée in his Dictionnaire.

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*Continued from Kew Bull., **1948,** 473.

Since the above account was written additional evidence has come to light concerning the distribution of *Hyalocalyx setifer.* In 1935 H. J. Schlieben collected it near Lukuledi in S.E. Tanganyika, The Tanganyika plants were growing in very much the same sort of habitat as those found by Mrs. Faulkner. But this extension of its known geographical range lends greater weight to the opinion that the species is a true native of the African mainland and it seems not improbable that it will be discovered in other places in the East African coastal region.

R. B. DRUMMOND & R. D. MEIKLE.

VIOLACEAE

Rinorea (Subgen. *Tubulosae,* Sect. *Violanthus,* §*Ilicifoliae*) **keayii** Brenan, sp. nov. ; ut videtur *R. afzelii* Engl., mihi e descr. tantum cognitae, proxima, foliis latioribus, pedicellis longioribus, sepalis petalisque multo majoribus, appendicula antherarum haud emarginata differt. *R. prasina* Stapf ex M. Brandt et *R. crassifolia* (Bak. f.) De Wild. differunt praeterea antheris sessilibus.

Arbor parva, circiter 7–8 m. alta. *Ramuli* glabri, virides, siccitate lineis elevatis striolati ; internodia superiora 0·5–1 cm. longa, inferiora multo longiora, usque ad 5 cm. longa. *Foliorum* petiolus validus, 0·8–2·2 cm. longus, circiter 2 mm. crassus, glaber ; stipulae caducissimae, omnes delapsae ; lamina coriacea vel subcoriacea, elliptica vel late elliptica, apice acuminata vel subacuminata, basi foliorum majorum rotundata minorum late cuneata, marginibus praesertim dimidio superiore sinuato-serratis dentibus haud spinescentibus, 13–20 cm. longa, 6–11·5 cm. lata, glabra, viva obscure viridis et nitida siccitate pallide vel glaucescenti-viridis, nervis lateralibus primariis utroque costae latere 6–9 sursum arcuatis et prope marginem anastomosantibus ut venis arcte areolatis utrinque sed praesertim supra prominentibus. *Inflorescentiae* terminales, paniculatae, ovoideo-pyramidales, satis laxae, circiter 5–8 cm. longae et 3–5 cm. latae, sessiles vel subsessiles, sparse et minutissime puberuli ; ramuli inferiores satis validi, usque ad 5 cm. longi, recti, erecto-patentes ; cymulae ultimae 2–5-florae ; pedicelli articulati, (3–) 5–7 mm. longi, glabri vel fere glabri, bracteolis minimis ovato-triangularibus minute ciliolatis instructi. *Flores* fragrantes, gilvi, inter affines magni, 7–8 mm. longi. *Sepala* crassa, rigida, suborbicularia vel latiora quam longa, 2·5–3 mm. longa, 2·5–3·5 mm. lata, apice rotundata, margine ciliolata, flabellatim plurinervata, nervis prominulis. *Petala* erecta, oblongo-elliptica, 5–6 mm. longa, 3 mm. lata, apice rotundata, glabra. *Staminum* filamenta brevia et lata sed distincta, 0·5 mm. longa, 0·75 mm. lata, basi in tubum brevissimum circiter 0·25 mm. altum connata ; connectivum apice in laminam siccitate brunneam ovato-triangularem 1·5 mm. longam 1·25 mm. latam productum ; thecae 1·6 mm. longae, 1 mm. latae, apice appendicula circiter 0·6 mm. diametro suborbiculari explanata sed marginibus basin versus valde inflexis superne paulum erosis. *Ovarium* glabrum, suborbiculare, 1·5 mm. diametro, apice stylo 3 mm. longo medio paulum incrassato. *Fructus* nondum visus.

NIGERIA. Ogoja Province, Obudu Division. Sonkwala area, R. Ata below Koloishe, in high forest of valley, c. 1220 m., 19 Dec. 1948, *Savory & Keay in For. Herb., Ibadan,* 25023 (Herb. Kew) :—small tree 8 m. high

with low spreading crown and cream flowers. Sonkwala area, in high forest on the Ikwette–Balegette path, S. escarpment of the grass plateau, 1370 m., 29 Dec. 1948, *Savory & Keay in For. Herb., Ibadan*, 25206 (typus in Herb. Kew) :—understorey tree c. 7 m. high with shiny dark green leaves and fragrant cream flowers.

The species of the §*Ilicifoliae* fall into two groups, having or lacking spinose teeth on the margins of the leaves ; *R. keayii* lacks them, and thus is related to three species, *R. afzelii* Engl., *R. prasina* Stapf ex M. Brandt and *R. crassifolia* (Bak. f.) De Wild., but is distinguished from all by, *inter alia*, the considerably larger flowers on longer pedicels. *R. prasina* and *R. crassifolia* are in addition separated by their sessile anthers. *R. prasina* is a shrub not a tree, and the thecae bear at their apex a much smaller appendage. *R. crassifolia* has obscurely repand-serrulate leaf-margins (not, however, entire as described by Baker), a narrowly cylindrical inflorescence about 4 cm. long and 1 cm. wide, pedicels up to about 2 mm. long, and sepals only about 1 mm. wide (dried), and a narrow appendage to the anther-thecae. In all these points they are at variance with *R. keayii.*

The lower surface of the leaves of the new species is abundantly speckled with tiny brown dots. Their abundance and evenness at first suggested those glands that make such an useful character in some species of *Rinorea.* Miss E. M. Wakefield kindly cut some sections of the leaves which showed that the dots were neither glands nor an attack by a fungus, but apparently punctures made by some small creature.

The new species is named after one of its collectors, Mr. R. W. J. Keay, of the Nigerian Forest Service, who has done much to further the study of the vegetation and flora of Nigeria.

J. P. M. Brenan.

POLYGALACEAE

Carpolobia suaveolens *Meikle*, sp. nov., *C. Goetzei* Gürke affinis, sed ramulis et costis pilosis floribusque minoribus facile distinguenda.

Frutex cortice albido, ramulis juvenilibus primo pilosis postea glabrescentibus. *Folia* varia, nunc ovata vel obovata, nunc lanceolata vel elliptica, usque 11·0 cm. longa et 4·0 cm. lata, integra, papyracea, supra glabra nitida, venulis reticulatis instructa, infra nervis lateralibus 7–12 impressis, costis valde prominentibus apicem versus glabris basin versus pilis longis pallido-fulvidis dense obtectis, apice obtusa vel acuta, basi in petiolum brevem pilosum usque 4·0 mm. longum coartata. *Flores* albi, circiter 7–10, in racemum axillarem brevissimum usque 8·0 mm. longum conferti ; pedunculi et pedicelli dense fulvido-pilosi ; pedicelli usque 4·0 mm. longi. *Bracteae* deltoideae, circiter 1·5 mm. longae 0·8 mm. latae, dense puberulae. *Sepala* 5, late ovato-lanceolata, subaequilonga, 4 circiter 6·0 mm. longa et 2·5 mm. lata, quintum circiter 5·0 mm. longum et 2·0 mm. latum, omnia apice obtusa et pilis brunneis obtecta. *Petala* 5, inaequalia, 2 superiora circiter 10·0 mm. longa et 4·0 mm. lata, undulato-crispata, 3 inferiora circiter 15·0 mm. longa et 5·0 mm. lata, omnia glabra et basi connata. *Stamina* 5, diadelpha, incurvata, glabra, dorso petalis adnata, filamentis complanatis usque 9·0 mm. longis, antheris rectangularibus circiter 1·0 mm. longis. *Ovarium* glabrum, fuscum, 3-loculare. *Stylus* glaber, arcuatus. *Stigma* globosum,

leviter 3-sulcatum. *Fructus* subglobosus, carnosus, 2–3-locularis, circiter 1·0 cm. diametro ; semina compressa, circiter 8·0 mm. longa et 6·0 mm. lata, pilis sericeis fulvidis dense velata.

PORTUGUESE EAST AFRICA. Quelimane District. Lugela, Namagoa estate, common along rivers, Nov.–Dec. 1946, *Faulkner* K 106 (type) :— a shrub with very numerous, white, lily-of-the-valley [*Convallaria*] scented flowers. " Makua country ", Namuli, *Last*, comm. 1887.

Allied to *C. Goetzei* Gürke, but with leaves of a thinner, papery texture, and the basal portion of the midrib densely and longly tawny-pilose. The flowers are somewhat smaller than those of other members of the genus, and crowded on short axillary racemes.

R. D. MEIKLE.

CARYOPHYLLACEAE

Spergula fallax (*Lowe*) *E. H. L. Krause* in Sturm, Fl. Deutschl., ed. 2, **5**, 21 (1901).

Arenaria flaccida Roxb. Fl. Ind. **2**, 447 (1832), non Clairv. (1811), *nom. illegit.*

Spergula pentandra L. var. *intermedia* Boiss. Diagn., ser. 2, **1**, 93 (1853).

Spergularia fallax Lowe in Hook., Journ. Bot. & Kew Gard. Misc. **8**, 289 (1856).

Spergula flaccida [Roxb.] Aschers. in Verh. Bot. Ver. Brand. **30**, p. XLIII (1889), *nom. illegit.*

TROPICAL ALGERIA. Ahaggar Mts., Tamanrasset, 1500 m., 20 Febr. 1931, *Meinertzhagen* 100.

A.–E. SUDAN. About 21° N. latitude, near coast, 900–1200 m., 1896, *Bent* s.n.

This species, better known as *Spergula flaccida*, is widely spread in rather dry habitats from Madeira and the Canary Islands to India. The above are the only two specimens at Kew from tropical Africa. It is easily distinguished from other species of *Spergula* on account of its having only 3 styles and a 3-valved capsule. Its seeds have a wide wing closely resembling those of *S. pentandra* L. The epithet *flaccida* cannot be used, as *Arenaria flaccida* Roxb. in a later homonym. I am grateful to my friend, Mr. J. E. Dandy, for calling my attention to the occurrence of this plant in the Sudan and to the need for rejecting its more familiar name.

E. MILNE-REDHEAD.

LINACEAE

Hugonia faulknerae *Meikle*, sp. nov., *H. busseanae* Engl. affinis sed foliis et floribus majoribus, stylis 3 manifeste differt.

Frutex vel arbor parva ramosa, cortice albido spongioso sulcato, ramulis lentis iuventute dense fulvo-villosis. *Unci* ut videtur nulli. *Folia* magna, anguste obovata, ad summos ramulos plerumque conferta, usque 16 cm. longa et 5 cm. lata, apice obtusa vel acuta, raro acuminata, basi in petiolum sensim coartata, margine remote denticulata, lamina supra iuventute sparse pubescens, postea calvescens, costa prominente pilis fulvis dense obtecta, nervis lateralibus 10–18 arcuatis adscendentibus, venulis eleganter reticulatis, infra pubescens, costa et nervis pilis longis

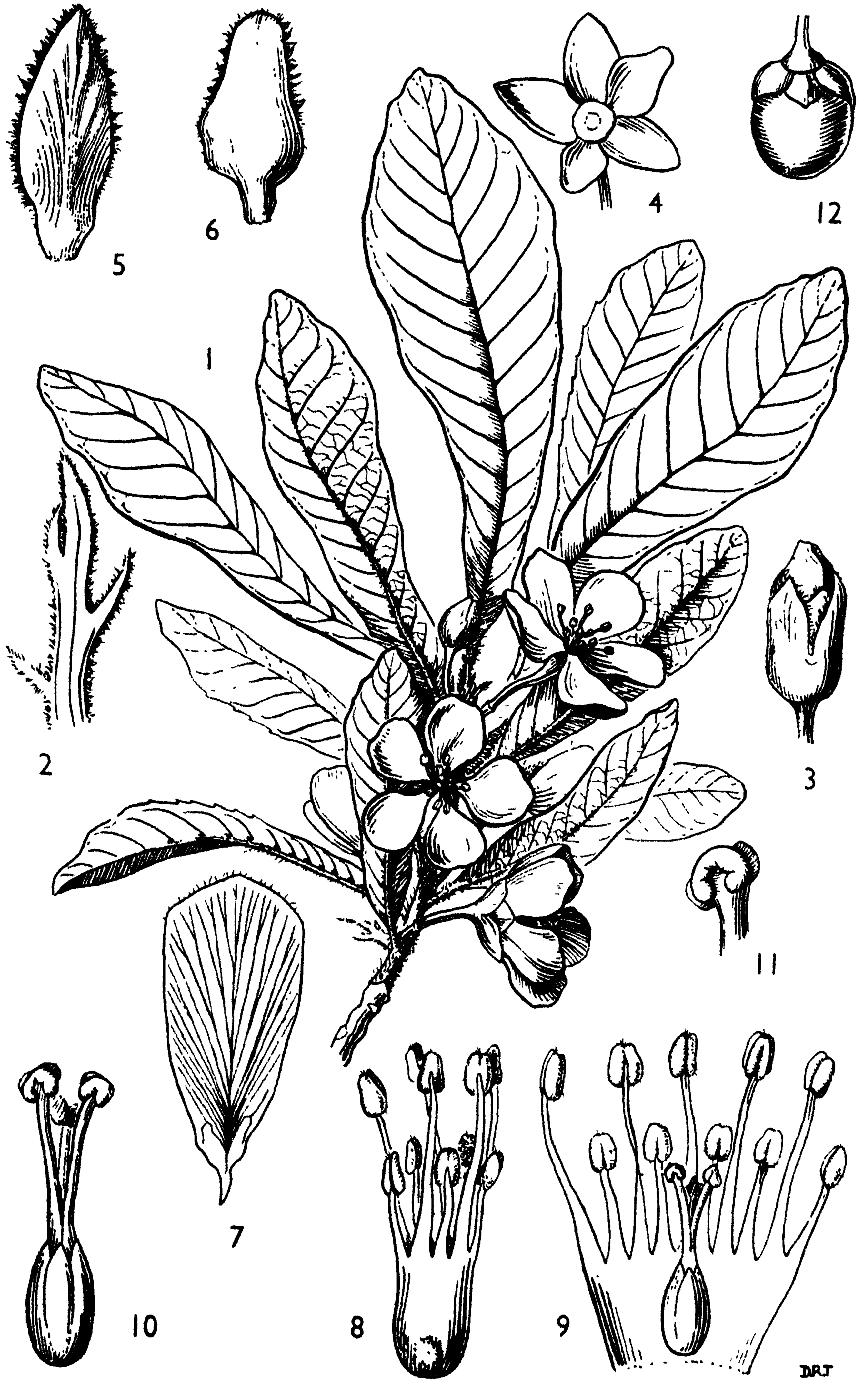

Fig. 1, *Hugonia faulknerae* Meikle. 1, flowering branch, × 1 ; 2, stipule, × 4 ; 3, flower-bud, × 2 ; 4, calyx, × 1 ; 5, outer sepal, outside view, × 3 ; 6, inner sepal, outside view, × 3 ; 7, petal, × 2 ; 8, androecium, × 3 ; 9, androecium cut open to show pistil, × 3 ; 10, pistil, × 6 ; 11, stigma, × 9 ; 12, fruit, × 1.

fulvidis ornatis, venulis valde prominentibus. *Petiolus* circiter 1 cm. longus, teres, dense fulvo-pilosus. *Stipulae* circiter 8 mm. longae, caducae, laciniatae, laciniis 3–7 subulatis usque 6 mm. longis intus glabris vel subglabris dorso longe argenteo-villosis. *Flores* axillares, solitarii, pedunculo circiter 2 cm. longo hirsuto basi manifeste articulato. *Bracteae* minutae, ovatae, acutae vel laciniatae, dorso dense argenteo-villosae. *Sepala* subaequalia, persistentia, basi connata : 3 exteriora ovata, circiter 8 mm. longa et 4·5 mm. lata, apice subacuta, dorso sparse vel dense villosa, intus brevissime tomentosa ; 2 interiora ovata, circiter 7 mm. longa et 5 mm. lata, apice obtusa, dorso sparsissime villosa, margine late membranacea, ciliata. *Petala* imbricata, conspicua, nitida, saturate lutea, cuneato-obovata, caduca, sepalis 3-plo longiora, usque 2·5 cm. longa et 1·4 cm. lata, basi unguiculata, apice minute ciliata. *Stamina* 10, uniseriata, alternatim longiora et breviora, longiora circiter 13 mm. longa, breviora circiter 7 mm. longa, filamentis complanatis glabris basi in tubum usque 2 mm. longum connatis. *Antherae* rotundae, 2 mm. diametro, 2-loculares, connectivo in appendicem penicillatam nonnunquam producto. *Styli* 3, usque 8 mm. longi, glabri, basi connati ; stigmata 3, viridia, peltata, inaequaliter lobata. *Ovarium* pyriforme, 2·5 mm. longum et 1·5 mm. latum, glabrum, 3-loculare, ovulis solitariis pendulis. *Bacca* carnosa, ovoidea, circiter 18 mm. longa et 12 mm. lata ; semina 3, parva. (Fig. 1, 1–12).

PORTUGUESE EAST AFRICA. Quelimane District. Lugela, Namagoa estate, in open forest, not common, Oct.–Nov. 1946, *Faulkner* K 80 (type), drawing no. 528 :—a small bush ; flowers sweet-scented. " Makua country ", Namuli, *Last*, comm. 1887.

A very elegant *Hugonia*, with large finely reticulate-veined leaves and handsome glossy flowers. The soft whitish bark of the older shoots is particularly characteristic.

R. D. MEIKLE.

Robbairea delileana *Milne-Redhead* in Kew Bull. **1948,** 452 (Jan. 1949).
Polycarpaea confusa Maire in Bull. Soc. Hist. Nat. Afr. Nord, **39,** 129 (June 1949), *nom illegit.*

I am glad to see that Dr. René Maire agrees with me as to the need for a new epithet for *Alsine prostrata* Del. (1813), but regret that, after so many years, our respective publications should so nearly have coincided. By chance the epithet *delileana* is the earlier, and in consequence a new combination will be needed by those who, like Dr. Maire, prefer to retain the plant in *Polycarpaea*.

E. MILNE-REDHEAD.

GERANIACEAE

Geranium purpureum *Vill.*, Pl. Delph. 72 (1785).
G. robertianum L. var. *purpureum* (Vill.) DC., Fl. Franç. **4,** 853 (1805) ; Knuth in Engler, Pflanzenr. IV, **129,** 66 (1912).

ERITREA. Mt. Alam Kalé, NW. of Aïderesó, 5 Apr. 1892, *Schweinfurth & Riva* 1491.

KENYA. Third day's march from Eldama Ravine, Nov. 1898, *Whyte* s.n. Between Nandi and Mumias, 1400–1800 m., Nov.–Dec. 1898,

Whyte s.n. Knight's Gorge on slope of Kinangop Escarpment, in damp shady places on rocky ground, 2340 m., Sep. 1934, *Albrechtsen* (*Coryndon Museum* 6687) :—an erect, hairy. slightly viscid herb, 3–6 dm. high, strongly scented like Herb Robert ; petals pale pink, the base of the claw white, without markings. Mt. Kinangop, in forest, c. 2650 m., Apr. 1938, *Chandler* 2249 :—height 3–4 dm., flowers pale pink. Mt. Kinangop, among undergrowth on forest path, 2400 m., 22 Dec. 1930, *Napier* 729 :—flowers pinky mauve. Ol-joro-Orok, 2300 m., Jan. 1932, *Pierce* (*Coryndon Museum* 1682). West Mt. Kenya, in Juniper forest at Nanyuki, 2100 ft., Jan. 1931, *A. W. Hill in Kenya For. Herb.* 2526 :—stems red.

Knuth (l.c.) cites three gatherings from Eritrea, all made by Schweinfurth, and also gives " Uganda (Wight sub nom. *G. ocellatum* !)". There is little doubt that this was an incorrect citation of the Whyte specimens cited above, both of which come from Kenya. These two sheets are merely labelled "Tropical East Africa" and, together with two of the other specimens here cited, had been named *G. ocellatum* Camb. Whilst it is recognized that critical investigation may reveal infra-specific differences between these African plants and the European species, I am following Knuth in treating them as *G. purpureum* Vill. in the broad sense. The occurrence of *G. purpureum* in Kenya is yet another example of the north temperate element in the flora of the East African equatorial mountains.

E. MILNE-REDHEAD.

FLACOURTIACEAE

Dasylepis eggelingii *Gillett*, sp. nov. ; *D. leptophyllae* Gilg affinis, statura minore, pedunculo longiore, floribus omnibus ☿, ovario styloque lanuginoso, stylo crassiore, placentis ramisque stigmaticis 4, differt.

Frutex ; ramuli virides, glabri. *Folia* glabra, chartacea, oblongo-lanceolata vel oblanceolata, apice acute acuminata, basi plus minusve late cuneata, margine remote sed manifeste serrato-dentata, 12–19 cm. longa, 3·5–7 cm. lata ; nervi laterales 6–8 et veni numerossissimi reticulati, supra parce, subtus alte, prominentes ; petiolus glaber, 6–12 mm. longus, supra sulcatus. *Racemi* axillares, multiflori, glabri, pedunculo 2–4 cm. longo incluso, ad 18 cm. longi ; bracteae minimae ; pedicelli tenues, basi articulati, 12–17 mm. longi. *Flores*, ut videtur, semper ☿. *Sepala* 5, libera, glabra, rigida, concava, ad 7 mm. longa, 6 mm. lata, 3 exteriora quam 2 interiora rigidiora intensiusque colorata. *Petala* c. 7, quorum intimum, vel duo intima, in stamina transeuntia, intus margineque pilosa, membranacea, ad 7 mm. longa, 2·5 mm. lata, basi intus valde callosa, callo lanuginoso 1·5 mm. longo 1 mm. lato. *Stamina* 25–30, hypogyna, libera vel hic inde basi leviter coniuncta ; filamenta 4–6·5 mm. longa ; antherae sagittatae, lobis basalibus divergentibus ad 1 mm. longis inclusis, ad 3 mm. longae. *Ovarium* lanuginosum, globosum, 3–4 mm. diametro, in stylum conicum lanuginosum 3 mm. longum sensim attenuatum, hinc facie ovoideum ; placentae parietales, pluriovulatae, 4 ; stigmatis rami 4, valde reflexi, longitudine inaequales, ad 2·2 mm. longi. *Fructus* pubescens, globosus, 1·8 cm. diametro, pericarpio lignoso, 1 mm. crasso, intus coriaceo. *Semina* pauca (c. 3), inaequaliter angulata, c. 7 mm. lata, atro-brunnea.

UGANDA. Ankole District. Kalinzu forest, c. 1500 m., June 1938, *Eggeling* 3710 (type) :—common shrub up to about 3 m., flowers decorative in pendulous racemes, calyx pink, petals white. Toro District. Kibale forest, c. 1500 m., May 1938 *Eggeling* 3631 :—understorey shrub 3 m. high, fruits purple-red in pendant bunches. Same area, July 1935, *Eggeling* 2111 (collected by Miss M. E. Fountaine) :—bush in forest, flowers pink (in bud).

As the " petals " and " sepals " are sharply distinct, these terms, which were those used by Oliver in his original account of the genus, seem more appropriate than the " inner and outer perianth segments " of Gilg.

J. B. GILLETT.

MELASTOMATACEAE

Osbeckia rhinanthifolia *Brenan,* nom. nov.

Osbeckia scaberrima Exell in Journ. Bot. **66,** Suppl. I, 176 (1928), non Hayata in Journ. Coll. Sc. Tokyo **30,** Art. 1, 115 (1911), *nom. illegit.*

J. P. M. BRENAN.

Dissotis elliotii *Gilg* var. **setosior** *Keay et Brenan,* var. nov. ; a typo differt caulibus etiam inferne squamis denticulatis plus minusve dense indutis, foliis supra setulis manifestioribus apice a laminae superficie liberis subtus setulis non appressis longioribus basi denticulatis densius vestitis utrinque scabris.

NIGERIA. Ogoja Prov., Obudu Division. Balleghete, 18 Jan. 1929, *Rosevear* 4/30 (Herb. Kew). N. side of Koloishe, in savannah grassland on moist rocky slope at head of small ravine, 1525-1650 m., 21 Dec. 1948, *Savory & Keay in For. Herb., Ibadan* 25080 (typus varietatis in Herb. Kew, Herb. Paris) :—coarse erect herb to 1-1·4 m. high ; stem green below, red-purple above ; petals deep violet. Grass Plateau, Ikwette, in moist grassland with *Maesa* shrubs at head of valley, 1585 m., 30 Dec. 1948, *Savory & Keay in For. Herb., Ibadan* 25236 (Herb. Kew) :—tall herb ; stem dark crimson ; leaves with pink nerves and midrib beneath, pale green above ; calyx-tube green, lobes pink, conspicuous in bud ; petals purple ; anthers yellow.

Typical *Dissotis elliotii* Gilg (in Engl., Monogr. Afr. Pfl. **2,** 19 : 1898), which was described from Sierra Leone, ranges as far eastwards as Bamenda in the British Cameroons ; it has stems smooth or sparsely scaly, sometimes more densely so in the inflorescence-region only ; the leaves are almost smooth to the touch above, the bristles although numerous appearing as short discolorous ridges fused with but slightly raised above the leaf-surface ; the under-surface is similar but the bristles are sparser and almost concolorous. The new variety described here has been found only in one area of eastern Nigeria. It differs in the greater development of indumentum on the stems and leaves ; the floral parts are similar. A single specimen in Kew Herbarium from the Bauchi Plateau in Nigeria (Vom, 915–1370 m., 1922, *J. Dent Young* 99) seems to be intermediate between typical *D. elliotii* and var. *setosior*, having smooth stems but leaves nearly as bristly as var. *setosior.*

R. W. J. KEAY & J. P. M. BRENAN.

COMBRETACEAE

Combretum butyrosum (*Bertol. f.*) *Tul.* in Ann. Sci. Nat., sér. VI, **4,** 87 (1856) ; Engl. et Diels in Engl., Monogr. Afr. Pfl. **3,** 81 (1899).

Sheadendron butyrosum Bertol. f., Ill. Piante Mozamb. **1,** 12, t. 4a & b (Mem. Acad. Sci. Istit. Bologna **2,** 72 : 1850).

KENYA. Nwachi, 1928, *R. M. Graham in Kenya For. Herb.* 1685 (with flowers, in Kew Herb. & Brit. Mus. Herb.) :—climber on low bush ; flowers white and sweetly scented.

This species was originally described from a specimen (*Fornasini* s.n.) collected in Mozambique, but was omitted from Lawson's account of the genus in Oliver's Flora of Tropical Africa. *Graham* (*Forest Herb.* 1685) from Kenya is the first specimen in the Kew Herbarium to be identified as *C. butyrosum*, and in the British Museum Herbarium the only other specimen is a fragment of what is evidently a specimen authenticated by G. Bertoloni himself. Unfortunately Graham's specimen does not include fruits and it is hoped that these may be collected in due course. According to Bertoloni's lithograph the fruits are of the wingless bulky type characteristic of other species of §*Chionanthoideae* Engl. & Diels.

R. W. J. KEAY.

HYPERICACEAE

Hypericum scioanum *Chiov.* in Ann. Bot. Rom. **9,** 317 (1911).

H. stolzii Briq. in Ann. Conserv. & Jard. Bot. Genèv. **20,** 391 (1919).

H. thoralfi T. C. E. Fries in Notizbl. Bot. Gart. Berl. **8,** 566 (1923).

H. afropalustre Lebrun and Taton in Bull. Jard. Bot. Brux. **18,** 279 (1947).

The known distribution of *H. scioanum* Chiov. is cited under *H. stolzii* in Kew Bull. **1948,** 455 (1949), but *Humbert* 7503 and *A. S. Thomas* 1058, which are *H. humbertii* Staner and not this species (see below), should be deleted, and the following added :—

ABYSSINIA. Shoa (Scioa) province, Entotto hill, lesser Cabanna valley, beneath *Erica*, 2600 m., 27 Apr. 1909, *Negri* 332 (type in Florence Herb.). Shoa, 1887, *T. Gennari*, s.n. (Florence).

BELGIAN CONGO. Foot of Mt. Mikeno, great Kikeri marsh, in peat, Nov. 1937, *Lebrun* 8512 (type of *H. afropalustre*) :—stem prostrate, rooting at the nodes, flowers yellow slightly orange.

We have been able to examine the type specimen of *H. scioanum* through the courtesy of Dr. Pichi-Sermolli of Florence, and find no specific difference between it and *H. stolzii, H. thoralfi* and *H. afropalustre*. Dr. Negri's plant, as compared with the east African material, has slightly narrower leaves, more pointed at base and apex. However Dr. Gennari's specimen is intermediate in this respect and the difference is, at most, of varietal rank.

J. B. GILLETT & E. MILNE-REDHEAD.

Hypericum humbertii *Staner* in Bull. Jard. Bot. Brux. **13,** 69 (1934).

BELGIAN CONGO. Kanzibi marsh, in mountains west of Lake Kivu, Jan. 1929, *Humbert* 7503 (type).

UGANDA. Kigezi District. Behungi, in swamp meadow, 2100 m., 19 Dec. 1933, *A. S. Thomas* 1058 :—common, prostrate, woody, ascending to 60 cm. ; flowers tawny yellow. Kanaba Gap, in swamp, 2400 m., June 1946, *Purseglove* 2073 :—herb to 50 cm., flowers yellow. Kanaba Gap, in swampy valley, Oct. 1947, *Purseglove* 2480 :—procumbent herb, flowers orange.

In the Kew Bulletin **1948,** 455 (1949) the opinion was expressed that *H. humbertii* is not distinct from what is here recognised as *H. scioanum* Chiov. (*H. stolzii* Briq.). However on re-examining the question in the light of further material and the characters used by Robyns (Flore du Parc Nat. Alb. **1,** 617–620 : 1948) we consider that this was a mistake and that *H. humbertii* is in fact specifically distinct. The characters separating the two species are as follows :—

Leaves cordate-amplexicaul at the base, sepals 5–6 mm. long, petals 6–8 mm. long, stamens in 3 groups of 12–15 . . . . *humbertii*

Leaves ± rounded at the base, sepals 3–4 mm. long, petals 4–5 mm. long, stamens in 3 groups of 5–9 . . . . *scioanum*

It is very difficult to distinguish stout forms of *H. scioanum* from stunted *H. humbertii* without counting the stamens.

J. B. GILLETT & E. MILNE-REDHEAD.

SCYTOPETALACEAE

Brazzeia longipedicellata *Verdcourt* sp. nov., *B. tholloni* Baill. affinis, sed pedicellis usque 4 cm. longis valde differt.

Arbor parva, usque 5–8 m. alta, sempervirens ; ramuli tenues, 1–3 mm. diametro, flexuosi, apicibus in calcaria circiter 5 mm. longa productis, glabri, supra sat nitidi brunnei, subtus ob epidermidis decorticationem griseo-brunnei vel albidi ; epidermis minute reticulata. *Internodia* usque 1–3 cm. longa, suprema oblique torta. *Folia* glabra, subcoriacea, supra griseo-olivacea, opaca, subtus siccitate brunnescentia, elliptica, acuminata, 4–12 cm. (plerumque 9 cm.) longa et 2–5 cm. (plerumque 4 cm.) lata ; lamina basi obliqua, latere altero 1–2 mm. longiore, acumine 1–1·5 cm. longo cuspidata, latere superiore 1·5 mm. lato, apice subobtusa. *Costa* subtus brunnescens, longitudinaliter minute striata ; nervi laterales utrinque 4–5, arcuati, adscendentes, supra obscuri, subtus sat prominentes, venae et venulae vix distinctae, nec impressae nec prominentes, lamina inter nervos leviter rugosa. *Petioli* breves, crassi, usque 3 mm. longi, alii brunneo-flavescentes, suberosi, rugosi, alii saturate brunneo-rufescentes, longitudinaliter minute striati. *Flores* in fasciculos trifloros ad ramos maturos copiose aggregati ; alabastra conica ; pedicelli circiter 4 cm. longi. *Calyx* cupularis, usque 12 mm. diametro, alabastro corollae arcte adpressus, primo subinteger vel subcrenatus vel irregulariter 3–4 lobatus, postea in lobos subtruncatos circiter 7 fissus. *Corolla* alba, carnosa, usque 3 cm. diametro, primo indivisa, postea in lobos subaequales vel inaequales irregulariter fissa, parte interiore costata ; corolla (teste Purseglove) demum reflexa et cum staminibus affixis caduca. *Stamina* numerosa, filamentis usque 6 mm. longis liberis vel basi usque ad medium rarissime geminato-connatis ; antherae flavae, elongatae, usque 3·5 mm. longae et 0·5 mm. latae, apice poris dehiscentes. *Ovarium* superius, globulare, circiter 4 mm. diametro, pericarpio crasso 6-loculare ; ovulae numerosae (circiter 100), axiles ; stylus 9–10 mm. longus, 0·5 mm. latus, linearis ; stigma parvum, vix capitatum, obscure 5-lobatum. *Infructescentiae* pedicelli usque 4 cm. longi. *Capsula*

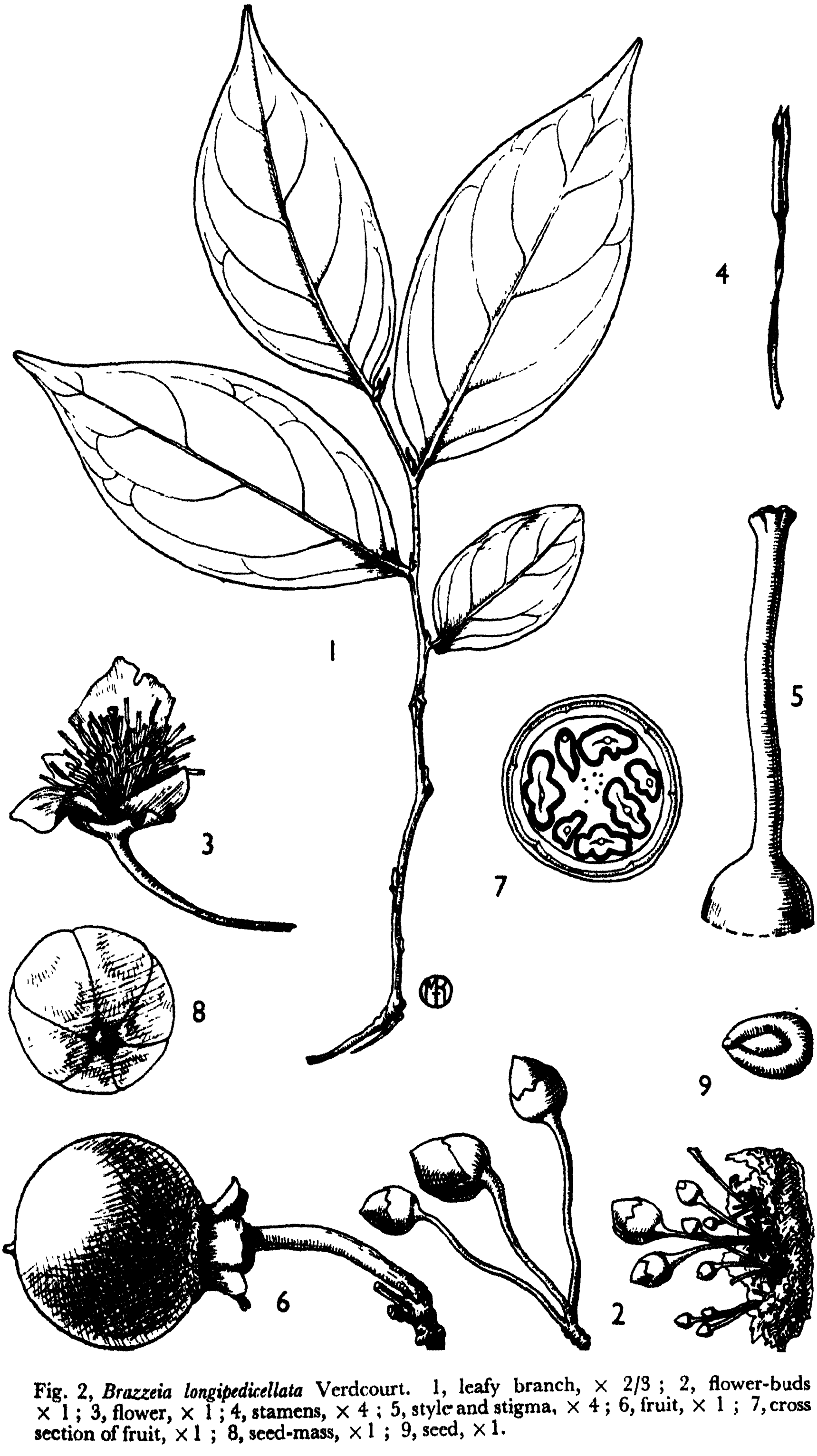

Fig. 2, *Brazzeia longipedicellata* Verdcourt. 1, leafy branch, × 2/3 ; 2, flower-buds × 1 ; 3, flower, × 1 ; 4, stamens, × 4 ; 5, style and stigma, × 4 ; 6, fruit, × 1 ; 7, cross section of fruit, × 1 ; 8, seed-mass, × 1 ; 9, seed, × 1.

globosa, lignosa, usque 2·8 cm. diametro, sulcis 6–7 obscurissimis superne notata, siccitate costis angustis 6–7 longitudinaliter striata ; pericarpium vivum c. 2·5 mm., siccitate c. 1 mm. crassum, parte exteriore sat rugosum, basi annulo pallido rugoso (? cicatrice corollae delapsae) notatam, et calyce reflexo persistente conspicue ornatum, parte interiore brunneum nitidum nacreum. *Semina* circiter 8, elliptica, compressa, subtus fovea irregulari ornata, supra umbone centrali a margine canaliculo elliptico separata, omnia inter pilos glutinosos dense conglomerata, siccitate capitulum solutum viscosum efformantia. (Fig. 2, 1–9).

Small glabrous evergreen tree from 15–25 ft. tall or less. Ultimate branchlets narrow 1–3 mm. in diameter, surface somewhat obscured by the growth of epiphytic cryptogams in the available material, youngest parts somewhat shining brown, lower parts greyish brown or whitish due to the fact that the brown microscopically reticulate epidermis has peeled off. These lower portions are partly discoloured by cryptogamous growths. Branchlets somewhat zigzag, i.e. internodes forming very obtuse angles with each other. There is a particularly noticeable angle between the terminal internode and the rest of the shoot below it. Internodes 1–3 cm. long. The apical, apparently terminal leaf is, of course, not truly terminal, and in fact to the left of the base of its petiole may be seen a short narrow spur about 5 mm. long and of the same colour as the young stem. This represents the aborted apex of the branchlet. Leaves glabrous, subcoriaceous, greyish olive-green and dull above, mostly brownish beneath in the dry state, elliptic, acuminate, 4–12 cm. (mostly 9 cm.) long, 2–5 cm. (mostly 4 cm.) broad. Acumen 1 to 1·5 cm. long, somewhat obtuse at apex where it is about 1·5 mm. broad. Leaves appearing sessile but actually with a short thick petiole about 3 mm. long. Some of the petioles are yellowish brown, rather corky and rugose, due to a covering resembling the stem epidermis, but the others are deep reddish brown and minutely longitudinally striate. The petioles are partly obscured because the leaves are unequal at the base, the lower half of the lamina joining the petiole 1–2 mm. further down than the upper half. Mid-vein brownish below, minutely longitudinally striate, lateral veins 4–5 on each side, arcuate-ascending, somewhat raised below and obscurely raised above, secondary and tertiary veinlets visible only as darker green lines beneath, not impressed nor raised. Between the main veins the lamina is slightly but distinctly rugose. Plant cauliflorous, flowers fleshy in clusters on the old wood. Each cluster is made up of numerous groups of three flowers. Pedicels of mature flowers about 4 cm. long. Calyx cupular, 12 mm. diam., in bud closely adpressed to the corolla, at first sub-entire or irregularly 3–4 lobed, but later tearing into a number of sub-truncate lobes (often 7 but indefinite). Corolla white, fleshy, conical in bud, and not divided into regular lobes, but as the bud grows tearing irregularly into 3–4 subequal or quite unequal parts with ribbed interior surfaces and irregular margins, finally (according to Purseglove) curving back and falling off with the stamens attached to it. The mature flower is about 3 cm. across. Stamens very numerous, largest filaments about 6 mm. long, free or rarely two joined together for about half their length at base. Anthers yellow, innate, elongate, 3·5 mm. long, 0·5 mm. broad, opening by apical pores. Ovary superior, globular, about 4 mm. in diameter, wall thick, 6-locular perhaps incompletely so at the base. Ovules numerous (± 100), placentation axile. Style 9–10 mm. long, 0·5 mm. broad, linear ; stigma a slight thickening at its end, obscurely five lobed. Fruiting pedicel 4 cm. long. Fruit a spherical indehiscent capsule up to 2·8 cm. diameter, pericarp woody about 2·5 mm. thick when fresh and 1 mm. thick when dry, with 6–7 very obscure grooves in the upper part when fresh, and with 6–7 narrow raised longitudinal ribs when dry, the areas between these ribs being somewhat rugose ; an annular area round the base, near the calyx, paler and rougher, probably scarred by the fallen corolla. Inner surface of pericarp covered with a brownish shining nacreous layer. Seeds about eight, elliptic, compressed with an irregular depression below, and an elliptical depression above which separates a smooth annular area from the central raised rugose boss. Seeds stuck together in a mass of sticky hairs to form a solid sphere which, in the dry condition, rattles in the capsule.

UGANDA. Kigezi District. Kayonza, Ishasha Gorge, stream-side in forest, 1200 m., Mar. 1946. *Purseglove* 2002 (type) :—tree 7·5 m., cauliflorous ; perianth fleshy, white, anthers yellow, fruit globular, orange, later brown, 2·5 cm. in diameter ; vernacular name *Omushabarara.* Ishasha Gorge, rare on the banks of a rocky stream with *Allanblackia* and *Chrysophyllum* in *Piptadenia buchanani–Parinari excelsa* evergreen rain forest on the steep banks of a rocky gorge, c. 1500 m., 10 Febr. 1945, *Greenway & Eggeling* 7105 (paratype in Amani Herb. and Kew Herb.) :—a small evergreen tree up to 4·5 m. tall with large round green plum-like fruits produced in clusters from the stem and older branches on long pedicels. Ishasha Gorge, *Purseglove* 3059 (flower buds and fruits in spirit).

Engler* separates *Brazzeia* from *Pseudobrazzeia* as follows :—

“ α) Fruit a loculicidal many-seeded capsule . . . . . *Brazzeia*
β) Fruit indehiscent.
  I. Fruit globose with evanescent septa, mostly four-seeded *Pseudobrazzeia* ”

Our material of the fruit of *P. tholloni* is inadequate but the pericarp would appear to lack the ribs and the number of seeds is greater than four. Further information concerning dehiscence is required for though the fruits of our *Brazzeia* material at Kew are ribbed in a similar manner to those of the new species it is doubtful whether the capsule is truly loculicidal in any of the species. The writer doubts very much if it is wise to maintain *Pseudobrazzeia* as a genus separate from *Brazzeia.* To enable field workers more easily to recognise this interesting tree, a full description in English is given above.

Brazzeia longipedicellata is apparently the first member of the *Scytopetalaceae* to be recorded for East Africa. Mr. H. K. Airy Shaw is of the opinion that this family is quite wrongly placed after the *Tiliaceae* and that its members should be transferred to the *Olacaceae* or at least near it, in which family it is interesting to note the first described member, namely *Rhaptopetalum coriaceum* Oliv. (in Journ. Linn. Soc. Bot. **8,** 160 : 1865) was placed. The writer wishes to thank Mr. J. W. Pursglove of the Department of Agriculture, Uganda, for obtaining a gathering of the flower-buds and fruit of *B. longipedicellata* preserved in spirit solution, which material has enabled a more accurate description to be prepared.

B. VERDCOURT.

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*Engl. Pflanzenw. Afr. **3(2),** 471 (1921).

STERCULIACEAE

Pterygota macrocarpa *K. Schum.* in Engl., Monogr. Afr. Pfl. **5,** 135 (1900).

This species is based on two gatherings, both said to be of unnamed collectors. The first, at Berlin, was from Victoria, whilst the second, from the Congo, was no. 836 and was said to be in the Brussels Herbarium. Through the kindness of Prof. W. Robyns, I have been able to examine this Brussels specimen. I find it is *Dewèvre* 836 and that it came from Lukolela, which is on the River Congo between Leopoldville and Coquilhatville. The specimen consists of a single large leaf, and it is clearly not the specimen from which Schumann drew up his diagnosis. The type of the above specific name must therefore be the specimen from Victoria in the British Cameroons. There are at Kew some excellent specimens of a species of *Pterygota* from Victoria, and these agree well with Schumann's description. To these I propose to apply the name *P. macrocarpa* K. Schum. Whilst it is not at present possible to say definitely that *Dewèvre* 836 is not conspecific with *P. macrocarpa*, it seems more likely that it is referable to a species of which I have seen a number of specimens from the Belgian Congo and from Uganda, and to which I have not yet been able to give a name. This tree has smaller flowers than those of *P. macrocarpa*, covered with a golden indumentum, and the fruiting follicles have a comparatively short stipe, whilst the larger flowers of *P. macrocarpa* have a greenish indumentum, and the stipe of the fruiting follicles is from 5–8 cm. long. The anthers of the only specimen with male flowers that I have examined are remarkably different from those of *P. macrocarpa*.

BRITISH CAMEROONS. Victoria, collector unknown, type in Berlin Herb. Victoria, at sea level (also on the slopes of the hills), Nov. 1927, *Maitland* 90 (fruit and mature leaves) :—a tall straight-boled tree with small crown and buttressed trunk. Victoria, at sea level, March 1929, *Maitland* 445 (mature leaves). Victoria, at sea level, Nov. 1929, *Maitland* 769 (flowers). Likomba Plantation, 15–35 Km. NE. of Victoria, 22 Nov. 1928, *Mildbraed* 10701 :—tall tree ; fallen leaves and flowers collected.

E. MILNE-REDHEAD.

EUPHORBIACEAE

Phyllanthus rotundifolius *Klein ex Willd.*, Sp. Pl. **4,** 584 (1805) ; Hutch. in Dyer, Fl. Trop. Afr. **6**(**1**), 731 (1912).

SENEGAL. Recorded by Trochain, Contrib. Étude Végét. Sénégal, 381 (1940).

FRENCH SUDAN. Timbuktu, 4 July 1927, *Hagerup* 147 :—near water ; height 1/8–1/2 m. ; flowers white-green ; fruits black. Timbuktu, *Hagerup* 158a. Both the Hagerup specimens have been identified with *P. niruri* L., which they are not.

This species, with a range extending from the Cape Verde Islands to India, is to be added to the Flora of West Tropical Africa. In that work it will key straight down to *P. niruri* L., from which *P. rotundifolius* may be easily distinguished by the stems and often the leaves being usually scabrid with numerous small pointed papillae, by the round or rounded-obovate leaves, and by the disc of the ♀ flowers which is annular and merely faintly crenulate, not deeply toothed.

J. P. M. Brenan.

Adenocline acuta (*Thunb.*) *Baill.*, Étud. Gén. Euph. 457 (1858) ; Pax in Engl., Pflanzenr. IV. **147** (vii), 410 (1914).

Acalypha acuta Thunb., Fl. Cap. (ed. Schult.) 546 (1823).

Nyasaland. Plateau of Mt. Zomba, 1500–1800 m., *Whyte* s.n. Zomba Plateau, at side of Mulungusi Stream, 1500 m., 27 Mar. 1937, *Lawrence* 319 :—plant 0·9–1·2 m. tall, much branched ; ribs on stem ; flowers green ; fruit 3-lobed.

A specimen of this South African species, collected in Nyasaland by Whyte, was recently discovered at the end of the *Umbelliferae* at Kew, where it appears to have reposed since J. G. Baker suggested it might represent a species of *Spananthe*. The sheet bears a stamp showing 5th June 1897 as the date of its receipt at Kew, but no date of collecting was given. On looking through the South African covers, a second Nyasaland sheet was discovered, this having been collected as recently as 1937.

A. acuta is widely spread in the Cape Province and Natal, whilst it reaches Barberton in the eastern Transvaal. The occurrence in Nyasaland is a very marked extension of range, but there is no reason to believe that it is not native in this tropical locality. It seems likely that, when the mountains of the Southern Rhodesia-Mozambique border are more thoroughly explored, intermediate stations for *A. acuta* may be found.

E. Milne-Redhead.

LEGUMINOSAE

Crotalaria grandistipulata *Harms* in Engl., Bot. Jahrb. **28**, 399 (1900).

[*Crotalaria lachnocarpa* (non Hochst. ex Bak.).—Bak. in Oliv., Fl. Trop. Afr. **2,** 33 (1871), pro parte, quoad spec. Welw. ; Hiern, Cat. Afr. Pl. Welw. **1,** 202 (1896) ; Harms in Warb., Kunene-Samb. Exped. 254 (1903) ; Bak. f. in Journ. Linn. Soc. **42,** 404 (1914) & Leg. Trop. Afr. 57 (1926), pro parte, quoad syn. *grandistipulata,* and in Journ. Bot. **66,** Suppl. I, 101 (1928), pro parte, quoad spec. no. 3087.].

Belgian Congo. Katanga Province. Kundulungu Mts., between rocks, 12 Mar, 1908, *Kassner* 2574. Elisabethville, 1935, *Quarré* 4420.

Tanganyika. Iringa District. Matanana Plateau [near the headwaters of the Little Ruaha River] in light bush, 1800 m., Mar. 1899, *Goetze* 737 (type in Berlin Herb., not seen by me) :—vernacular name *muhumbu.*

Nyasaland. North Nyasa District. Njakwa, 16 Febr. 1947, *Benson* 1177.

Northern Rhodesia. Broken Hill District. Mulungushi River near Broken Hill, Febr. [1907], *Allen* 487 :—bushy shrub, 9–12 dm. Solwezi District. Mutanda Bridge, among dry grass in *Brachystegia* woodland, 26 June 1930, *Milne-Redhead* 601 :—perennial with thick

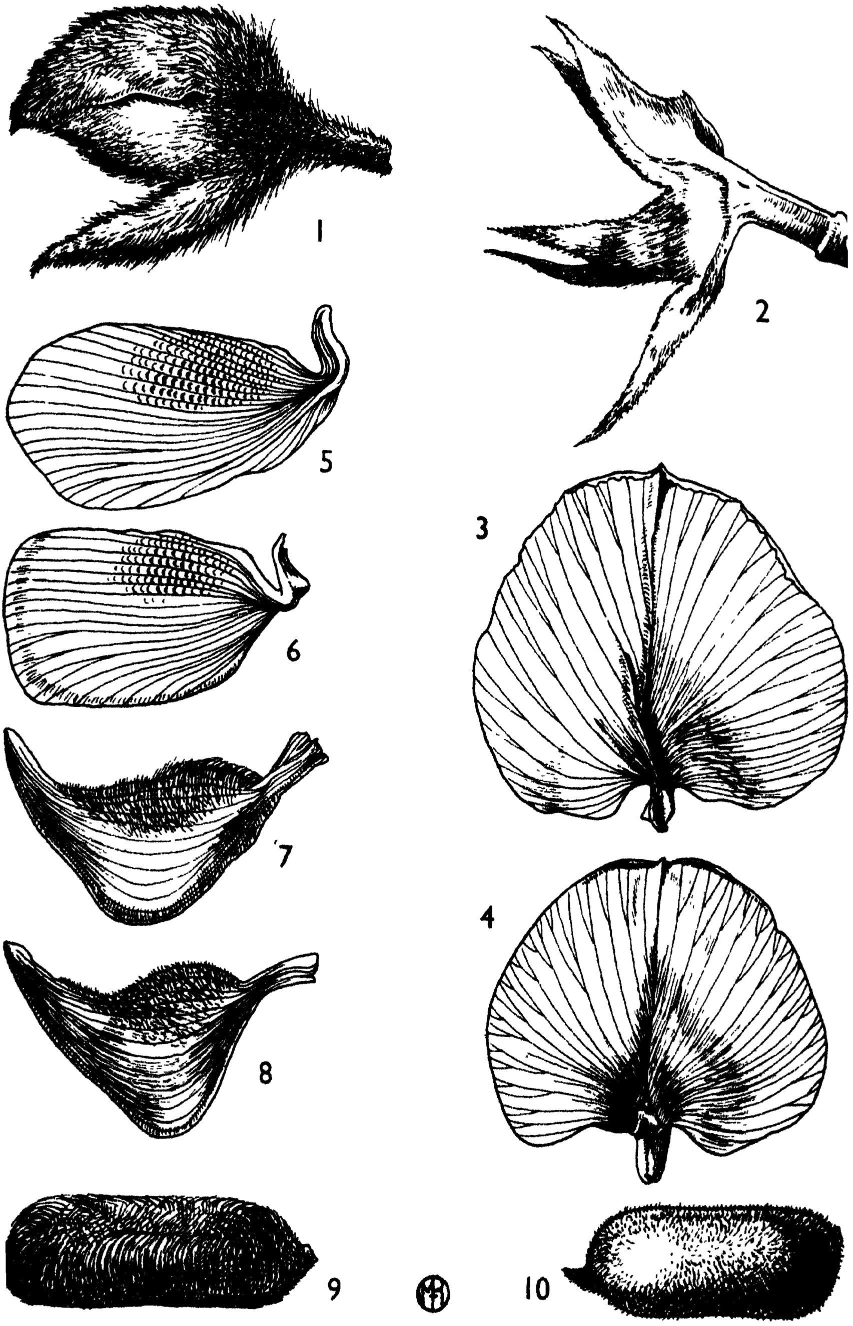


FIG. 3. 1, 3, 5, 7 and 9. Calyx, standard, wing, keel and fruit of *Crotolaria lachnophora* A. Rich. 2, 4, 6, 8 and 10. Calyx, standard, wing, keel and fruit of *Crotolaria grandistipulata* Harms. Fruits natural size ; other parts × 2.

root; shoots 6 dm. high; seeds chestnut-coloured. Mwinilunga District. [Probably Kalene Hill], in bush on sandy soil, Febr. [1929], *J. M. Marks* 14 :—shoots 6 dm. high; leaves light green; calyx with silvery hairs; flowers bright yellow, flame, and deep red, without scent. Luakera Falls, N. of Mwinilunga, on sandy ground in *Brachystegia* woodland, 25 Jan. 1938, *Milne-Redhead* 4331 :—same as *Milne-Redhead* 4150 [see below].

ANGOLA. Moxico District. E. of R. Zambezi and S. of R. Luhanda, in *Brachystegia—Isoberlinia* woodland on sand, 15 Jan. 1938, *Milne-Redhead* 4150 :—roots narrow, vertical, over 3 dm. long; stems greyish, pubescent; leaves and stipules dull green; calyx pale green; petals at first yellow with few red lines at base of standard, later standard and wings becoming coppery-orange; keel greenish-yellow. Bié District. R. Longa near Minnesera, on sand, 1200 m., 7 Jan. 1900, *Baum*6 46 (K., B.M.) :—stems 5 dm. high; flowers bright yellow. Rare in short thicket-grown pastures at the mouth of R. Cuartiri, 16 Apr. 1906, *Gossweiler* 3087 (K., B.M.) :—a biennial undershrub; primary stem branched some 4·5 dm. above ground; branches short; flowers yellowish shaded brown. Rather rare in abandoned maize plantations near the Sambala Mucuba, left bank of R. Cuchi, 26 Dec. 1912, *Gossweiler* 2438 (B.M.) :—a branched or suffruticose shrublet, total height 12 dm.; stem erect; branches ascending; flowers showy, sulphur-yellow and red-brown. Bié, 1300 m., 1930, *Gossweiler* s.n. (B.M.) Huila District. Catumba in the territory of Lopolo, sporadic in wooded meadows, Dec. 1859, *Welwitsch* 1916 (K., B.M.) :—an erect leafy perennial herb, 3 4·5 dm. high; flowers deep yellow soon turning purple; petals as well as the leaflets rather thick and rigid. Cuanza Norte District. Pungo Andongo, sporadic by moist thickets near Lombe, Mar. 1857, *Welwitsch* 1915.

For long this species has been confused with its close ally, *Crotalaria lachnophora* A. Rich. (syn. *C. lachnocarpa* Hochst. ex Bak.), a species of considerably larger size, and usually much branched habit. *C. grandistipulata* has, at least early in the season, simple erect stems which arise annually from a long narrow vertical rootstock. The indumentum of the pedicels and calyx is adpressed and often silvery, whilst the lobes are attenuate and separate in anthesis. In *C. lachnophora* the indumentum of the pedicels and calyx is spreading and tawny, and the calyx lobes are broader, suddenly narrowed to a point, with the lateral ones cohering in pairs at flowering time. Fig. 3.

Whilst the distributions of these two species overlap, that of *C. grandi stipulata* is definitely more restricted, and as will be seen from the above citations it is not known from north of the 8°S. latitude. The type locality is on the watershed of the Great and Little Ruaha Rivers at about the place where the Iringa-Njombe motor road now crosses it. As this is the *locus classicus* of a number of species collected by Goetze, the types of which are now lost, it is highly desirable that further collections be made from this easily reached locality in March, which was the month that Goetze visited it some 52 years ago.

E. MILNE-REDHEAD.

Indigofera subulata *Vahl ex Poir.* in Lam., Encycl. Suppl. **3,** 150 (1813); DC., Prodr. **2,** 223 (1825); Bak. in Oliv., Fl. Trop. Afr. **2,** 87 (1871), pro parte ; Bak. f. in Journ. Bot. **41,** 263 (1903) & in Leg. Trop. Afr. 146 (1926).

I. thonningii Schumach. et Thonn., Beskr. Guin. Pl. 366 (1827).

[*I. trita* (non Linn. f.)—Bak. in Oliv., Fl. Trop. Afr. **2,** 86 (1871) ; Taub. in Engl. Pflanzenr. Ost.-Afr. **C,** 210 (1903) ; Bak. f., Leg. Trop. Afr. 144 (1926).].

var. **scabra** (*Roth*) *Meikle,* comb. nov.

I. scabra Roth, Nov. Pl. Sp. 359 (1821) ; Spreng., Syst. Veg. **3,** 277 (1826).

I. flaccida König ex Roxb. [Hort. Beng. 98 (1814), *nomen nudum,* et] Fl. Ind., **3,** 375 (1832), *descr.*

I. mucronata Spreng. ex DC., Prodr. **2,** 227 (1825) ; Rydberg in N. Amer. Fl. **24,** 145 (1923), non Lam., Encycl. **3,** 247 (1789), *nom. illegit.*

I. retroflexa Baill. in Bull. Soc. Linn. Paris **1,** 399 (1833) ; Bak. f. in Journ. Bot. **41,** 263 (1903) & in Leg. Trop. Afr. 145 (1926).

?*I. jamaicensis* Spreng., Syst. Veg. **3,** 277 (1826).

Attempts to distinguish *I. subulata* Vahl ex Poir., with three leaflets, from *I. scabra* Roth (*I. mucronata* Spreng. ex DC.), with five or more leaflets, have given rise to considerable confusion. Apart from the number of leaflets there is little to separate the two plants ; *I. subulata* tends, perhaps, to have smaller leaves and flowers and shorter pods than *I. scabra,* but this is not always the case, and, failing to discover additional distinctive characters, I have decided that the most satisfactory arrangement is obtained by treating the latter as a variety of the former. It is a pity that the more uncommon of the two plants, the trifoliolate *I. subulata,* should have to be the species, and the more widespread *I. scabra* the variety, but under the present rules of nomenclature this unfortunate result cannot be avoided.

Typical 3-foliolate *subulata* is entirely African, predominating in West Africa, where Thonning first collected it ; further south and east the 5- or more foliolate var. *scabra* becomes increasingly abundant, and in East Africa both seem to be equally common. The var. *scabra* is also widely distributed in Central and South America, the West Indies, Madagascar, India and Tropical Asia.

With regard to the synonymy : *I. mucronata* Spreng. ex DC. must be rejected, not only as a later synonym of *I. scabra,* but as a later homonym of *I. mucronata* Lam. (=*I. cytisoides* (Linn.) Murr.). De Candolle seems to have overlooked the fact that he had previously (Prodr. **2,** 223 : 1825) made the same species synonymous with *I. subulata* Vahl ex Poir.

Baker (Fl. Trop. Afr. **2,** 86–87, also Fl. Brit. Ind. **2,** 96–97) distinguishes 3-foliolate and 5-foliolate plants under the names *I. trita* Linn. f. and *I. subulata* Vahl respectively, but Thonning's material of the latter species, made available through the courtesy of the authorities at Copenhagen and Florence, is all trifoliolate, so that the name cannot be used for 5-foliolate plants. The occurrence in Africa of genuine *I. trita* Linn. f. is somewhat doubtful ; with the possible exception of four specimens (A.-E. Sudan, *Andrews* A. 98 and A. 121, Kenya, *R. E.* & *T. C. E. Fries* 188, Tanganyika, *Rounce* 48), all the material so named at Kew consists of various forms of *I. subulata,* and it is clear that the name *I. trita* has been employed by several authors in an extended sense to include both *I. subulata* and *I. subulata* var. *scabra.* The four specimens mentioned above may be forms of *I. trita,* but their inflorescences are in every case considerably longer and more lax than those of the true Indian plant, and I would prefer, for the present, to regard them as forms of *I. subulata.* The relationship of *I. trita* with *I. subulata* is undoubtedly a close one, but the differences in habit, inflorescence and infructescence seem to be real and constant.

Type material of *I. retroflexa* Baill., kindly lent by the Director of the Muséum Nationale d'Histoire Naturelle, Paris, appears to be in no way distinct from *I. subulata* var. *scabra.* Baillon does not comment on the affinities of *I. retroflexa* in his brief description of the species.

Dolichos falcatus *Klein ex Willd.*, Sp. Pl., ed. 3, 1047 (1802) ; DC., Prodr., **2,** 398 (1825) ; Spreng., Syst. Veg., **3,** 249 (1826) ; Roxb., Fl. Ind., **3,** 311 (1832), excl. syn. ; Wight & Arn., Prodr. Fl. Pen. Ind. Or., **1,** 249 (1834) ; Thwaites, Enum. Plant. Zeylan., 90 (1859) ; Bak. in Hook., Fl. Brit. Ind., **2,** 211 (1876) ; Trimen, Hand. Fl. Ceyl., **2,** 77 (1894) ; Alston in Year-Book, Dept. of Agr., Ceylon (1927), 33, t. VIII and in Kandy Flora, 30, t. 157 (1938) ; non Burtt Davy, Man. Fl. Pl. & Ferns Transv., 423 (1932).

D. debilis Hochst. ex A. Rich., Tent. Fl. Abyss., **1,** 223 (1847) ; Bak. in Oliv., Fl. Trop. Afr., **2,** 213 (1871) ; Taub in Engl., Pflanzenw. Ost-Afr., **C,** 224 (1895) ; Harms in Engl., Pflanzenw. Afrik., III, **1,** 678 (1915) ; Bak. f., Leg. Trop. Afr., 449 (1929).

D. andongensis Welw. ex Bak. in Oliv., Fl. Trop. Afr., **2,** 213 (1871) ; Hiern, Cat. Welw. Afr. Pl. **1,** 264 (1896) ; Bak. f., Leg. Trop. Afr., 449 (1929).

[*D. trilobatus* (non L.).—Wall Cat. 5541, *nomen nudum.*].

ABYSSINIA. " In rupibus vallis Mai-Mezano prope Djeladjeranne ", 4 Sept. 1840, *Schimper* 1472. " In vallis Mai-Mezanno rupibus frutices humiliores scandens ", 21 Sept. 1840, *Schimper* 1440. Abyssinia, 1862, *Petit* 622. " Ex Tigre versus Begemder ", 1863–8, *Schimper* 450.

UGANDA. Masaka District. Makole, 21 Apr. 1935, *A. S. Thomas* 1262 :—occasional climber to 6 dm., flowers pale greenish pink. Karamoja District. Lochoi, 1200 m., 24 May 1940, *A. S. Thomas* 3536 :—a common herb ; root edible, eaten raw ; flowers flushed pink.

KENYA. Vanga, Nov. 1929, *Graham in Kenya For. Herb.* no. 2225 :—small, very thin stemmed climber on grass or low bush ; flowers ½ inch, bright mauve with darker purple markings on the standard ; an irregular light green band along the middle of the leaflets ; pods flattish, 9 × 1·3 cm. Mida, *Graham in Kenya For. Herb.* no. 1952 :—small climber on bush near forest edges ; flowers pink or mauve pink, pods 8 cm.

TANGANYIKA. Mwanza, 16 Apr. 1926, *Davis* 113. Morogoro, 510 m., 1935, *Rounce* 435. Mafia Island, Kanga, not very common in *Dactyloctenium, Pennisetum ciliare* grasses in abandoned road on the margins of coconut plantations, ca. 4·5 m., 14 Aug. 1937, *Greenway* 5101 :—a perennial procumbent herb with small pink flowers and flat pods. Mafia Island, Baleni, rare in *Phyllanthus, Maprounea africana, Strychnos spinosa* closed bush on a grey sandy soil, ca. 9 m., 2 Sept. 1937, *Greenway* 5210 :—a climbing herb with small pink flowers and flat curved pods.

ZANZIBAR. Pemba, *J. H. Vaughan* 422. Zanzibar, 1931, *J. H. Vaughan* 1084.

PORTUGUESE EAST AFRICA. Chiloane, 12 Aug. 1887, comm. *L. Scott.* Quelimane District. Mocuba, Namagoa estate, not common, among grass and undergrowth close to streams, Aug. 1946, *Faulkner* P 119 :—flowers pale rose-pink.

SOUTHERN RHODESIA. Odzi, 1050 m. *Eyles* 8603 :—climber on edge of water furrow ; flower bright pink. (A subglabrous form with narrow leaflets).

ANGOLA. Pungo Andongo, sparingly, in damp forests near Candumba, in company with *Oxytenanthera abyssinica* Munro, fl. and ripe fr. end of March 1857, *Welwitsch* 2207 (type of *D. andongensis* Welw. ex Baker).

NATAL. Near Durban, 25 May 1883, *J. M. Wood* 3185 :—purple.

Not uncommon in many parts of India, Ceylon and Burma.

[The Transvaal specimens, *Bolus* 11019, 11840, *Galpin* 753, *Kirk* 93a, *Rogers* 23856 and *Wilms* 412, cited by Burtt Davy, Man. Fl. Pl. & Ferns Transv., 423, differ from *D. falcatus* in several respects and must be considered distinct. *J. M. Wood* 565 from Inanda, Natal, is a form of *D. formosus* A. Rich.].

There appears to be no reason for maintaining the supposed distinction between the Indian *D. falcatus* Klein ex Willd. and the African *D. debilis* Hochst. ex A. Rich. The Schimper (type) material of *D. debilis* from Abyssinia represents a somewhat tenuous, small-flowered form of the species, but *D. falcatus* exhibits a wide range of variation in general robustness, leaflet size and indumentum, flower size and colour, and forms just as slender as type *D. debilis* occur in India and Ceylon.

D. andongensis Welw. ex Baker is scarcely more than a sub-glabrous state of *D. falcatus*—the statement in Fl. Trop. Afr. **2,** 213 (repeated in Cat. Welw. Afr. P. **1,** 264) that *D. andongensis* is " quite glabrous " requires qualification : the young leaflets of the Kew specimen are distinctly strigillose, and scattered hairs occur along the midribs of some of the older leaflets. Weak forms of *D. formosus* A. Rich, are easily confused with *D. falcatus,* though typical specimens are quite distinct. The former species is nearly always more robust, with larger and more abundant flowers and denser indumentum (the stems of *D. formosus* are frequently clothed with closely adpressed silky hairs ; those of *D. falcatus* are either glabrous or with a thin covering of scattered, patent or slightly reflexed hairs). The stipules of the two species also differ, those of *D. formosus* being short, broad, obtuse, or bluntly pointed, and 9 or more nerved, while those of *D. falcatus* are longly acuminate, sharp-pointed and 5–7 nerved.

A. H. G. Alston remarks (Year-Book, Dept. of Agr., Ceylon (1927) 33) that the leaflets of *D. falcatus* frequently have " a light coloured marking down the middle " ; it is interesting to note that the leaflets of at least one African specimen (Kenya, *R. M. Graham,* 2225) are said to be similarly marked.

R. D. MEIKLE.

Neorautanenia pseudopachyrrhiza (*Harms*) *Milne-Redhead*, comb. nov.

[*Pachyrrhizus angulatus* (non Rich.).—Bak. in Oliv., Fl. Trop. Afr. **2,** 208 (1871), pro parte, quoad spec. ex Barter, Petherick et Schimper.].

Dolichos pseudopachyrhizus Harms in Engl., Bot. Jahrb. **26,** 320 (1899).

C. A. Smith (in Burtt Davy, Man. Fl. Pl. & Ferns Transv. 416 : 1932) treats *Dolichos* §*Pseudopachyrhizus* Harms as a genus distinct from *Dolichos*, a view which I wholeheartedly support. The genus *Neorautanenia* Schinz., made to contain a single species from S.W. Africa, was already available, and Smith published several combinations with Schinz's generic name. The species on which Harms based his Section *Pseudopachyrhizus* has, however, hitherto remained in *Dolichos*. As the name is required for publication in a revised " Flora of the Sudan " now in course of preparation, the necessary combination is here made.

E. MILNE-REDHEAD.

Eriosema Burkei *Benth.* in Harv. & Sond., Fl. Cap. **2,** 260 (1862).

Eriosema leucanthum Welw. ex Bak. f. in Journ. Bot. **33,** 234 (1895).

E G. Baker in his " Revision of the African Species of *Eriosema* " (Journ. Bot. **33.** 97 et seq. : 1895) places *E. burkei* in a group " B " having " caules erecti vel suberecti plus minusve virgati " whilst *E. leucanthum* appears much farther on in his classification in group " I " having " caules (saepe herbacei) prostrati vel adscendens rarius erecti ". As the stems of both plants are erect, they would fall into either group " B " or " I ". The only other character given by Baker that distinguishes these groups is that " B " has woody rootstocks not known by him to be napiform whilst " I " has a tuberous napiform rootstock. *E. burkei* has a rootstock which in young plants is both napiform and woody and which in age enlarges, tending to loose its napiform shape, and would be described merely as woody. It is clear, therefore, that there is no justification for placing *E. leucanthum* and *E. burkei* so far apart.

In his " Leguminosae of Tropical Africa " (1929), the same author places *E. leucanthum* next to *E. burkei* in his Series VII and separates them on whether the leaflets are oblong, elliptic-oblong, elliptic or oblong-oblanceolate in *E. burkei* or linear to linear-oblong in *E. leucanthum*, characters which the abundant material now available shows to be variable and of no specific diagnostic importance.

In floral characters a good deal of variation in the width of the standard is evident, yet I feel that there can be little doubt that these two specific names represent but a single species. There is now at Kew a fine series of specimens showing that *E. burkei* is widely spread in southern Africa. It has long been recognized as occurring in Southern and Northern Rhodesia, and it is common in the *Brachystegia* woodlands of the Solwezi and Mwinilunga Districts not far from the Belgian Congo border (see map, p. 359). Yet Staner and De Craene omit mention of *E. burkei* occurring in the Congo. This omission is explained by their recognizing *E. leucanthum* and citing three gatherings under that name from Katanga.

E. MILNE-REDHEAD.

Eriosema cryptanthum *Milne-Redhead*, sp. nov., foliis unifoliolatis pellucide punctatis racemos omnino tegentibus, floribus minimis ab omnibus congeneribus perdistincta.

Herba perennis, 5–7 cm. alta, radice tuberosa plus minusve napiformi circiter 1·5 cm. longa et 1 cm. diametro instructa. *Caulis* unicus, simplex, erectus, foliosus, compressus, angulatus, anfractuosus, internodiis 2–8 mm. longis, angulis retrorsim crispule hirsutis. *Stipulae* lanceolatae, superne attenuatae, apice acutae, usque 6 mm. longae, 1·5 mm. latae, glabrae, erectae, persistentes. *Folia* 7–10, unifoliolata, breviter petiolata, superiora racemos omnino tegentia ; lamina elliptica, ovata vel obovata, apice obtusa, acuta vel apiculata, basi late cuneata, rotundata vel subcordata, 13–40 mm. longa, 7–23 mm. lata, utrinque glabra, dense pellucide glanduloso-punctata ; petioli 1·5–2·5 mm. longi, parce crispule hirsuti ; nervi laterales 4-5-jugi, supra inconspicui, subtus prominuli. *Racemi* 1–4, ex axillis foliorum superiorum orti, 7–8 mm. longi, multiflori, densiflori, pedunculo 5–10 mm. longo breviter retrorsim hirsuto instructi ; bracteae reflexae, ovato-lanceolatae, apice attenuatae, 1·7–2·5 mm. longae et circiter 0·6 mm. latae, margine sparse ciliatae, persistentes ; pedicilli 0·5–1·0 mm. longi, breviter hirsuti. *Calyx* circiter 2 mm. longus, sparse brevissime ciliatus, glaber, glandulosus, subaequaliter lobatus, lobis circiter 0·5 mm. longis deltoideis. *Vexillum* obovatum, superne plus minusve oblongum, valde complanatum, apice emarginatum, basi in unguem cucullatum productum, circiter 4·5 mm. longum, 3 mm. latum ; alae oblique oblongae, longe unguiculatae, in toto circiter 5 mm. longae, glandulosae ; carina oblique ovata, longe unguiculata, in toto circiter 5 mm. longa, glandulosa. *Stamina* circiter 4 mm. longa ; antherae minutae, circiter 0·2 mm. diametro. *Ovarium* sessile, antice longe albo-hirsutum, postice glabrescens. *Legumen* valde compressum, breviter ellipticum, circiter 6 mm. longum et 4·5 mm. latum, parce longe hirsutum. *Semina* 2 mm. longa, 1·6 mm. lata, leviter compressa, brunnea, hilo stramineo conspicuo instructa (Fig. 4).

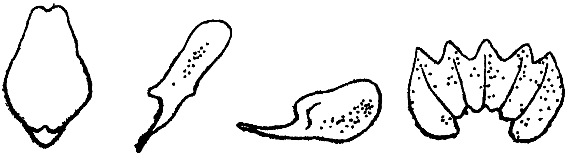


Fig. 4, calyx and petals of *E. cryptanthum* Milne-Redhead.

NORTHERN RHODESIA. Mwinilunga District. About 0·8 Km. S. of Matonchi Farm, among grass in *Brachystegia* woodland, 14 Febr. 1938, *Milne-Redhead* 4577 :—perennial with ovoid or spherical tuber and single stem ; leaves green, completely hiding the inflorescence ; calyx green ; standard yellowish green.

E. cryptanthum stands alone in the subgenus *Eueriosema* Staner et De Craene in having its flowers and fruits completely hidden from view by its leaves, and in its leaves being closely beset with pellucid glands.

The flowers are unusually small for the genus, and are rendered very inconspicuous by the absence of a normally developed standard. In *E. cryptanthum* the standard is narrowed in the upper half, which remains folded over the wing and keel petals when the flower is fully developed. Nectaries are absent, so that it would seem unlikely that the plant relies on insect visitors to effect its pollination. Rather would it appear that the flowers are cleistogamous, but direct evidence of this is, unfortunately, lacking.

The nature of the glands is probably unique in *Eriosema*, in that they are set within the mesophyll of the leaf, each gland showing above the epidermis of both the upper and lower surface and forming a direct channel for transmitted light. The leaves of a few of the specimens examined were softened in hot water so that the hidden inflorescences could be examined. On drying these specimens the glands in the leaves assumed a quite different appearance. The liquid had expanded and formed a minute bubble at each end of the gland, and these bubbles were opaque and sulphur coloured, so that both surfaces of the leaves now appeared beset with numerous sulphur dots, and the leaves had become opaque to transmitted light.

Growing in the rich herbaceous vegetation of the *Brachystegia* woodland at Matonchi Farm, *E. cryptanthum* is an exceedingly inconspicuous plant which may well be more frequent than this single gathering suggests. Had I not been collecting some other plant alongside it, it is doubtful whether I should ever have noticed the plant and discovered it to be in flower and fruit.

E. MILNE-REDHEAD.

Eriosema velutinum *Bak. f. et Haydon* in Bak. f., Leg. Trop. Afr. 510 (1929). (Fig. 5).

UBANGI. Yalinga, 1923–24, *Le Testu* 4793. Near R. Zimbala, 50 Km. N. of Bambari, in a herbaceous marsh, 26 June 1923, *Tisserant* 1146 :—stems single, 1·5 m. high ; flowers yellow.

UGANDA. Entebbe, 1909, *Fyffe* 91.

TANGANYIKA. Kahama District. About 64 Km. S. of Nungwe, Emin Pasha Gulf, in *Brachystegia—Isoberlinia* woodland, 12 Dec. 1936, *M. L. Morgan* 62 (B.M.) :—straggly plant, c. 6 dm. ; flowers yellow. Kigoma District. S. Muhambwe, 1926, *C. H. B. Grant* s.n. (B.M.). Ufipa District. Namanyere, Kouongo, 6 Dec. 1921, *Swynnerton* 21 (type in B.M.).

NORTHERN RHODESIA. Mwinilunga District. Source-of-Matonchi Dambo, in seasonally wet ground on sand, forming clumps in grassland, 16 Febr. 1938, *Milne-Redhead* 4606 :—perennial with arching shoots ; stems yellowish, much flattened and twisted ; leaves dull green, grey-green below with yellowish midrib ; plants not yet in flower.

ANGOLA. Moxico District. Near Ikula Hot Springs by R. Zambezi, in boggy grassland, 17 Jan. 1938, *Milne-Redhead* 4179 :—herb with rather branched pale brownish stems, flattened especially above ; leaves dull

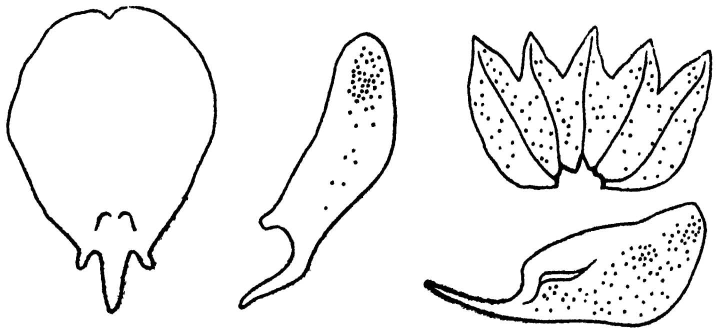


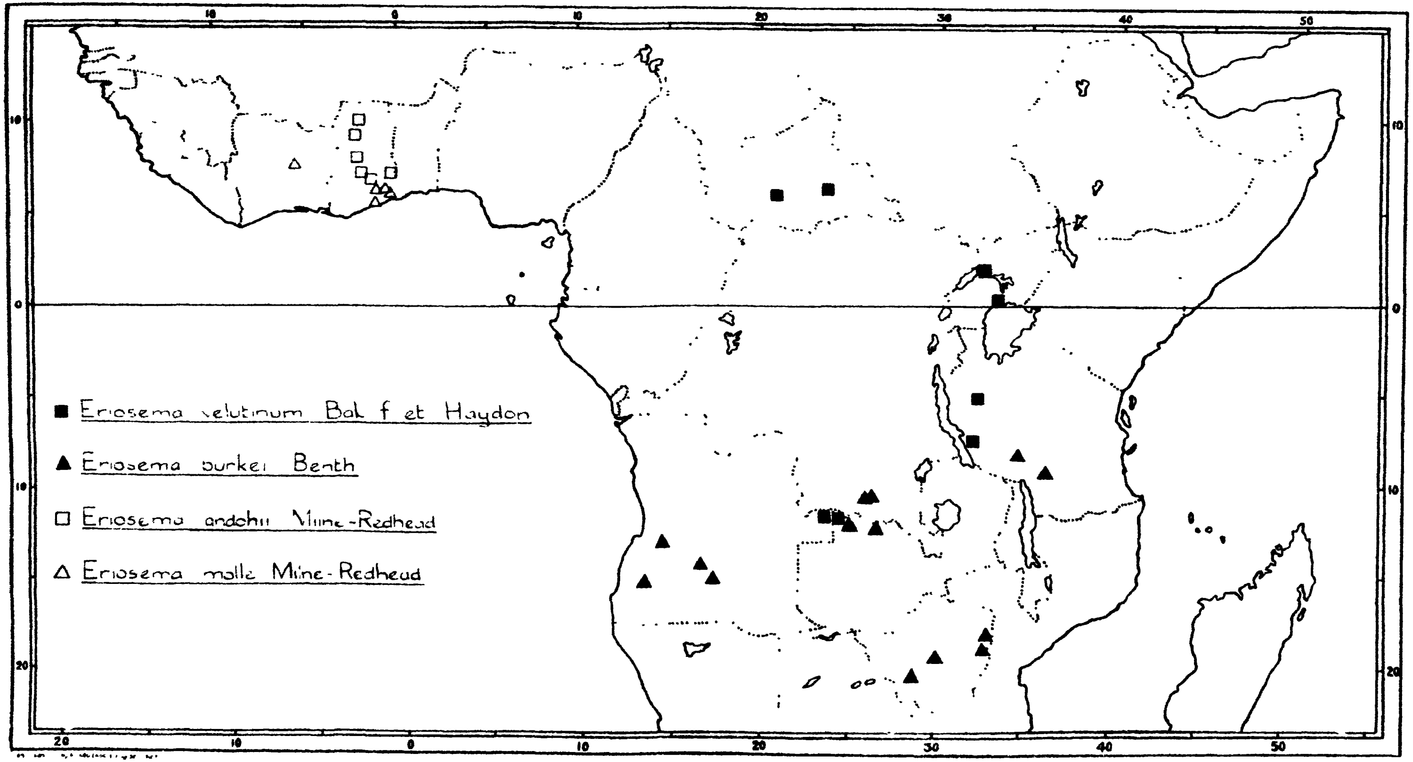
Fig. 5, calyx and petals of *Eriosema velutinum* Bak. f. et Haydon, all × 4.

green, grey below ; one plant flowering out of season ; calyx pale green ; standard yellow ; other petals whitish.

This most distinct species has a much wider distribution than was indicated by the three East African gatherings cited by its authors. It has been found by Le Testu at Yalinga in Ubangi and by myself in the Mwinilunga District of Northern Rhodesia and in the adjacent part of the Moxico District of Angola. According to Staner & De Craene, the species was not known from the Belgian Congo when they published their revision of the Congo species of *Eriosema* in 1934 (Ann. Mus. Cong. Belg. Bot. sér. 6, **1,** 37–92). In *Eriosema velutinum* it would appear that we have an almost perfect example of the type of distribution which I describe as circum-Congo. Of the eight available gatherings, five of them are from separate territories all of which surround the Congo Basin (see map, p. 359). This circum-Congo distribution is responsible for a striking floristic similarity between parts of Uganda and the Mwinilunga District of Northern Rhodesia.

In Northern Rhodesia and Angola *E. velutinum* is a plant of seasonally wet grasslands on sand where it forms conspicuous clumps with arching yellowish branched stems. The contradictory terms used by Baker & Haydon—" caulis erectus prostratus "—fail to give a correct idea of the habit. The short, dense, almost sessile racemes are themselves racemousely arranged on the branches of the inflorescence. But quite the most unusual character of *E. velutinum*, and one which the authors omitted to mention, is the strongly flattened almost ribbon-like upper parts of the stems and the branches of the inflorescence and, as Tisserant (Bull. Mus. Nat. Hist. Nat. Par., sér. 2, **2,** 323 : 1930) points out, the fact that the ultimate branches of the inflorescence are held horizontally and that the racemes are brought into the vertical by the remarkable twisting of these flattened internodes, alternately to the right and the left, giving the inflorescence a unilateral appearance. Another character worthy of mention is the frequent occurrence of leaves with four leaflets.

E. Milne-Redhead.


■ Eriosema velutinum Bak f et Haydon
▲ Eriosema burkei Benth
□ Eriosema andohii Milne-Redhead
△ Eriosema molle Milne-Redhead
10
0
10
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30
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Fig. 6. Distributions of *Eriosema andohii*, *E. burkei*, *E. molle* and *E. velutinum*.

Eriosema molle [*Hutch ex*] *Milne-Redhead*, sp. nov. ; affinis *E*. *velutino* Bak. f. et Haydon, sed foliis multo minoribus, caulibus erectis haud arcuatis superne plus minusve teretibus haud valde compressis et tortilibus, calycibus minoribus, leguminibus et seminibus majoribus differt.

Herba erecta, usque 12 dm. alta. *Caules* pauci, graciles, leviter lignosi, breviter velutini, demum basin versus glabri, plus minusve sulcati, superne leviter ramosi, densiuscule foliosi. *Stipulae* ovato-lanceolatae, acutae, circiter 3 mm. longae, extra breviter pilosae, intus glabrae. *Folia* digitatim quinquefoliata vel interdum trifoliata, subsessiles vel brevissime petiolata ; petioli usque 2 mm. longi, velutini ; foliola oblanceolata, apice rotundata vel acutiuscula, basi in petiolulum usque 3 mm. longum attenuata, usque 22 mm. longa et 7 mm. lata, lateralia aliquanto minora, supra leviter et brevissime velutina, subtus pilis adpressis griseis densissime sericea et sparsissime minuteque flavo-glandulosa ; costa et nervi laterales supra inconspicui, subtus prominuli dense fulvo-velutini ; nervi laterales 7-9-jugi. *Racemi* axillares, folia plus minusve aeqantes vel breviores, circiter 20-flori, velutini ; pedunculi circiter 3 mm. longi, velutini ; bracteae ovatae, acutae, circiter 1·5 mm. longae, velutinae, mox deciduae ; pedicelli usque 1 mm. longi, velutini. *Calyx* circiter 4 mm. longus, subaequaliter lobatus, extra parce velutinus et parcissime flavo-glandulosus, intus puberulus, lobis vix 2 mm. longis deltoideis acutis. *Vexillum* obovatum, breviter unguiculatum, apice emarginatum, basin versus biauriculatum, 9 mm. longum, 7 mm. latum, appendicibus nectariferis haud instructum, extra apicem versus parce pilosum glandulosumque, intus glabrum ; alae oblique obovato-oblongae, longe unguiculatae, circiter 9 mm. longae, 3 mm. latae, glabrae ; carina oblique obovato-oblonga, obtusa, longe unguiculata, circiter 9 mm. longa, 3 mm. lata, apicem versus flavo-glandulosa. *Stamina* circiter 9 mm.

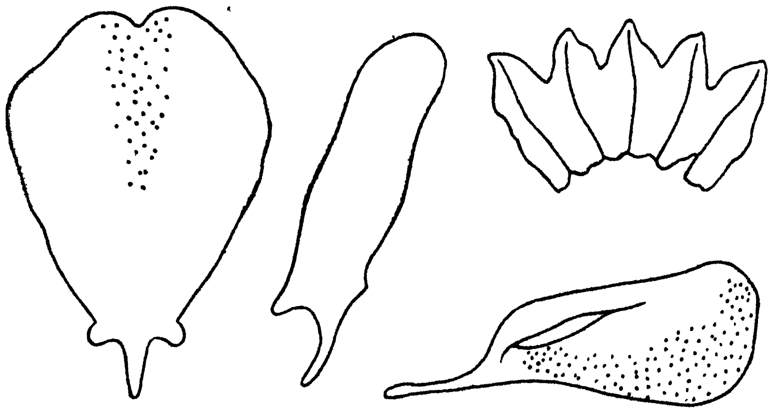

Fig. 7, calyx and petals of *Eriosema molle* Hutch. ex Milne-Redhead, all × 4.

longa ; antherae minutae, circiter 0·2 mm. diametro. *Ovarium* sessile, dense longeque albo-hirsutum ; stylus inferne parce hirsutus, superne glaber. *Legumen* valde compressum, breviter ellipticum, circiter 14 mm. longum et 9 mm. latum, extra longe fulvido-hirsutum. *Semina* 5 mm. longa, 3–3·5 mm. lata, compressa, castanea, hilo conspicuo instructa. (Fig. 00).

Ivory Coast. Between Yeboué and Blangouakro in the region of Bonaké, 1937, *Scaëtta* 3068.

Gold Coast. Accra District. Achimota, in grassland with *E. glomeratum*, 29 Aug. 1941, *Milne-Redhead* 5124 :—erect herb, 9–12 dm. ; stems few, slender, woody ; leaflets 3–5, sessile ; flowers pale dull yellow ; fruits brown. Akwapim District. Shai Hills [in the plains SE. of the Akwapim Hills], gregariously frequent in savannah, April, *Irvine* 1429 (type) :—erect herb 9–12 dm. high, multistemmed and shrubby ; branches almost vertical ; flowers golden yellow ; pods becoming brown when ripe. Volta River District. Anum, Krepi, 20 Jan. 1900, *W. H. Johnson* 567 :—plant 12 dm. ; flowers yellow. Kwahu District. Sesiamang, 27 Febr. 1930, *A. S. Thomas* D137 :—erect, 15 dm. high ; flowers butter yellow.

This distinct species has been overlooked for many years, for there is a specimen at Kew (*Johnson* 567) which was collected in 1900. Both this and a subsequent collection (*Thomas* D137) have been referred to *E. cajanoides* (Guill. et Perr.) Hook. f., under which name it was placed in the Flora of West Tropical Africa. The third gathering of *E. molle* to reach the Kew Herbarium (*Irvine* 1429) was recognized by Hutchinson as an undescribed species, but he did not publish a description. When stationed at Achimota during the last war, I noticed the plant growing at one locality in the grasslands near the College, and found that that it would not run down to any of the species in the Flora of West Tropical Africa. Fragments which I pressed in a book and brought home, agreed well with Irvine's specimens. Further search in the West African covers of *Eriosema* at Kew revealed the two first mentioned specimens mixed with specimens of *E. andohii* in the covers of what is now called *E. psoraleoides*. Subsequently a specimen of *E. molle* has been received from the Muséum Nationale d'Histoire Naturelle, Paris, collected by Scaëtta in the Ivory Coast.

E. molle is undoubtedly related to *E. velutinum* on the one hand and to *E. andohii* [see below] on the other, forming a connecting link between these two species, both of which share with it the digitate arrangement of the leaflets so uncommon in the genus. The upright habit and small leaves distinguish it at once from *E. velutinum* whilst the quinquefoliolate leaves and smaller flowers with acute calyx lobes serve to separate it from *E. andohii*.

E. Milne-Redhead.

Eriosema andohii *Milne-Redhead*, sp. nov., ab *E. psoraleoidi* (Lam.) G. Don foliis digitatim trifoliolatis subtus argenteo-sericeis supra glabris, inflorescentiis quam folia vix longioribus, et ab *E. molli* Hutch. ex M.-R. foliis trifoliolatis subtus haud fuscis supra glabris, floribus majoribus dentibus calycis obtusiusculis differt.

[*Eriosema cajanoides* (non Hook. f.).—Hutch. & Dalz., Fl. W. Trop. Afr. **1**, 403 (1928), pro minore parte.].

E. psoraloides (Lam.) G. Don var. *argenteum* Bak. f., Leg. Trop. Afr. 508 (1929), pro parte, excl. spec. Caille (*Chevalier* no. 14632).

Herba erecta, usque 18 dm. alta. *Caules* leviter lignosi, velutini, demum basin versus glabri, plus minusve sulcati, superne leviter ramosi, densiuscule foliosi. *Stipulae* lanceolatae, acutae, circiter 4 mm. longae, extra pilosae, intus glabrae. *Folia* digitatim trifoliolata, subsessilia vel breviter petiolata ; petioli usque 3 mm. longi, velutini ; foliola oblanceolata, apice rotundata vel acutiuscula, basi in petiolulum usque 2·5 mm. longum attenuata, usque 4·0 cm. longa et 1·2 cm. lata, lateralia aliquanto minora, supra glabra sed costa inconspicue adpresse sericea, subtus argenteo-sericea ; nervi laterales 8–14-jugi. *Racemi* axillares, folia plus minusve aequantes vel iis leviter longiores, 15–25-flori, velutini ; pedunculi 2–4 mm. longi, velutini ; bracteae lanceolatae, attenuatae, circiter 4 mm. longae, velutinae, mox deciduae ; pedicelli circiter 1 mm. longi, velutini. *Calyx* circiter 4 mm. longus, subaequaliter lobatus, extra parce velutinus et parcissime flavo-glandulosus, intus puberulus vel glabrescens, lobis circiter 1 mm. longis ovatis obtusiusculis. *Vexillum* obovatum, breviter unguiculatum, apice emarginatum, basin versus biauriculatum, usque 13 mm. longum et 8·5 mm. latum, appendicibus nectariferis haud instructum, extra apicem et medium versus parce breviter pilosum et flavo-glandulosum, intus glabrum ; alae oblique oblongae, longe unguiculatae, circiter 12 mm. longae et 3 mm. latae, parcissime flavo-glandulosae ; carina oblique obovato-oblonga, obtusa, longe unguiculata, circiter 12·5 mm. longa et 4 mm. lata, apicem versus flavo-glandulosa. *Stamina* circiter 13 mm. longa ; antherae circiter 0·5 mm. diametro. *Ovarium* sessile, circiter 3 mm. longum, dense longe albo-hirsutum ; stylus circiter 10 mm. longus, inferne parce adpresse hirsutus, superne glaber. *Legumen* valde compressum, breviter ellipticum, circiter 14 mm. longum et 10 mm. latum, extra longe fulvido-hirsutum. *Semina* 5·5 mm. longa, 3·5–4 mm. lata, pallide brunnea castaneo-marmorata, hilo ochraceo conspicuo instructa.

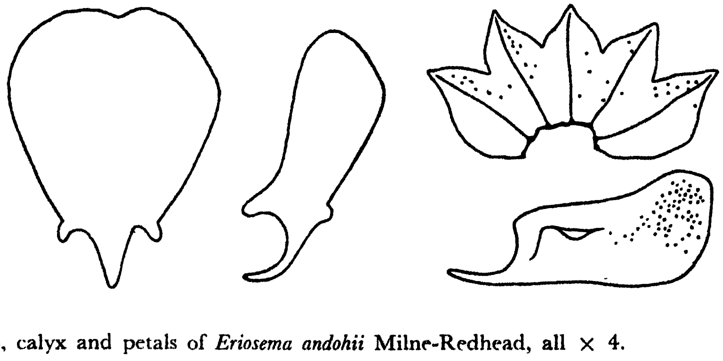

Fig. 8, calyx and petals of *Eriosema andohii* Milne-Redhead, all × 4.

Gold Coast. Ho District. Alavanyo, gregarious, frequent at edge of swampy patches in lowland savannah in open, 180–240 m., 24 Sept. 1934, *St. Clair-Thompson* 1438 :—erect herb to 12 dm., multistemmed and shrubby ; flowers yellow ; native name *mase ewe.* ? Kwahu District. Afram Plains, Jan. 1928, *Irvine* 620 :—woody herb, 12–18 dm. high ; backs of leaves covered with white hairs ; flowers yellow. Mampong District. Near Ejura, in savannah forest, 270 m., Nov. 1934, *Vigne in For. Herb.* 3465 :—herb 6–12 dm. high ; flowers yellow. Kintampo District. Kintampo, 20 Mar. 1920, *Dalziel* 14. W. Gonja District. Damongo, common in places in savannah forest, July 1943, *Andoh in For. Herb.* 5191 (type) :—erect shrub, 15 m. high, with silky leaves in threes ; flowers ornamental, bright yellow. Wa District. Kulpawn Channel between Kullum and Katua, 26 Apr. 1927, *Kitson* 829 (K., B.M.). Northern Territories. Without locality, 1922, *N. C. McLeod* 819. With locality, 1916, *Kitson* s.n. (B.M.).

Whilst undoubtedly allied to *E. psoraleoides* (Lam.) G. Don, this species is quite easily distinguished from it. The seven specimens which are here cited agree well with each other. An untypical and possibly damaged shoot on Dalziel's specimen shows leaves up to 5·5 cm. long and inflorescences up to 11 cm., but it is accompanied on the same sheet by a normal specimen. The type specimen is in flowering state, so the description of the fruits has been taken from another gathering, namely from *Kitson* 829.

The *nomen nudum*, *E. argenteum* A. Chev., was applied to a specimen in Chevalier's herbarium, no. 14632, collected by Caille in French Guinea. This gathering is represented at Kew by a shoot of a plant which I would hesitate to place under *E. andohii* although it does possess certain features in common with it. Caille's plant has a sparsely villous upper surface of the very pointed leaflets and an inflorescence thrice exceeding the leaves. Until more and better material of this plant is available, I prefer to leave it undetermined.

E. G. Baker, however, made it a variety of *E. psoraleoides* in his Leguminosae of Tropical Africa, 508 (1929), validating the epithet with this short phrase in English—" a variety of the above with narrow leaflets, silvery below ". He cites Caille's specimen and adds the " Gold Coast ", meaning to refer to it some of the above cited specimens. To avoid any confusion I have given the Gold Coast specimens a new name. The epithet was chosen in honour of Mr. J. E. Andoh, of the Gold Coast Forest Department, from whose gathering the above description has been drawn up.

There is a striking resemblance between *E. andohii* and *E. molle*, but the latter species is easily separated from it by the characters given in the diagnosis. *E. andohii* thus forms a connecting link between the pinnately trifoliolate *E. psoraleoides* and the digitately quinquefoliate *E. molle* and *E. velutinum*. It is strange that two species of this small but natural group should be so strictly limited in their distribution (see map, Fig. 6) and should both occur in the Gold Coast.

E. Milne-Redhead.

Cylicodiscus paucijugus (*Harms*) *Verdcourt*, comb. nov.

Piptadenia paucijuga Harms in Engl., Bot. Jahrb. **51,** 368 (1914).

Cylicodiscus battiscombei Bak. f. in Journ. Bot. **67,** 198 (1929).

Although the type of *Piptadenia paucijuga* has not been seen by me and probably does not now exist (*Leopold in Holtz* 3207, from Usaramo, Tanganyika), there can be little doubt that the above synonymy is correct. Both Mr. P. J. Greenway and Mr. J. P. M. Brenan agree that this is so. Harms mentions in his description that the stamens are affixed to a cupuliform disc, a character exhibited by the species of *Cylicodiscus*.

B. VERDCOURT.

Acacia sieberiana *DC.* var. **villosa** *A. Chev.* in Bull. Soc. Bot. France **74,** 959 (1928).

[*Acacia rehmanniana* (non Schinz).—Hutch. et Dalz., Fl. W. Trop. Afr., **1,** 360–361 (1927) ; A. Chev. in Rev. Bot. Appl. **8,** 197 (1928) ; Bak. f., Leg. Trop. Afr., 838 (1930), pro parte, quoad syn. *Acacia sieberiana* DC. var. *villosa* A. Chev.].

[*Acacia sieberiana* DC. var. *rehmanniana* (Schinz) Roberty in Candollea **11,** 142 (1948), quoad syn. *A. sieberiana* var. *villosa* A. Chev.].

Acacia sieberiana DC. var. **vermoeseni** (*De Wild.*) *Keay et Brenan*, stat. nov.

Acacia vermoeseni De Wild., Pl. Bequaert. **3,** 68 (1925) ; Bak. f., Leg. Trop. Afr. 837 (1930).

Acacia sieberiana DC. var. **woodii** (*Burtt Davy*) *Keay et Brenan*, stat. nov.

Acacia woodii Burtt Davy in Kew Bull. **1922,** 332 (1922) ; Bak. f., Leg. Trop. Afr. 838 (1930) ; Burtt Davy, Man. Fl. Pl. & Ferns Transv. 334 (1932).

Examination of specimens shows that the name *Acacia rehmanniana* has been widely misapplied to plants which appear to be only hairy varieties of *A. sieberiana* DC. The true *A. rehmanniana* Schinz (in Bull. Herb. Boiss. **6,** 525 : 1898) was described from the Transvaal, and specimens in the Kew Herbarium show that it ranges northwards through S. Rhodesia as far north as the River Kabompo in N. Rhodesia. It differs obviously from all forms of *A. sieberiana,* especially in the pod which has stiffly coriaceous valves longitudinally wrinkled on the outer surface, and normally dehisces while still on the tree. In addition, the coarse spreading indumentum usually golden on the young parts, the numerous short closely arranged pinnae, the small leaflets, and the inflorescences on usually short peduncles crowded towards the ends of the shoots, give this species a most distinctive appearance. The involucels provide a further useful character, being at or near the base of the peduncle in *A. rehmanniana,* but in the upper half at the peduncle in *A. sieberiana.*

A. sieberiana is a variable species, but in all its forms the pod is thick and woody, lacks the conspicuous wrinkles of *A. rehmanniana,* and dehisces tardily upon the ground.

At least three variants of *A. sieberiana* have densely pubescent young twigs. Chevalier, rightly we consider, described a variant in West Africa as *A. sieberiana* var. *villosa* ; the type-number of this (*Chevalier* 700, from Ouré, French Sudan) we have examined in the Kew Herbarium. This plant was misidentified with *A. rehmanniana* in the Flora of West Tropical Africa, and subsequent authors, including Chevalier himself, have accepted this view. Roberty rightly regarded this plant as a variety of *A. sieberiana* but made the new combination var. *rehmanniana* (Schinz) Rob., which is illegitimate because var. *villosa* A. Chev. was included as a synonym.

In typical *A. sieberiana* in West Africa the leaflets range in length from 2·5–4·5 mm., while those of var. *villosa* are normally only 2–2·5, very rarely up to 3 mm. It is therefore suggested that the var. *villosa* may have been derived from a small-leafleted form of typical *A. sieberiana.* The measurements here and in the following paragraphs are taken from median leaflets of the pinnae of mature leaves.

In East and South Tropical Africa what we consider to be var. *vermoeseni,* another hairy variant of *A. sieberiana,* occurs. This is very similar to var. *villosa* but differs in the larger leaflets, 3–5·5 (–6) mm. long. Measurements of leaflets of typical East African *A. sieberiana* show a range in length from 2·75–6 mm.—slightly greater than that in the West. It seems as though var. *vermoeseni* may have been derived from a form of the typical plant with comparatively large leaflets. A further tendency in var. *vermoeseni* is for the production of rather larger capitula (var. *vermoeseni* : 10–16 mm. diam. ; var. *villosa* : 6–10 mm. diam. ; measurements taken from pressed specimens). Our interpretation of var. *vermoeseni* is based on a specimen from Northern Rhodesia (*Rogers* 8570) stated by Dr. J. Hutchinson to have been compared with the type. Var. *vermoeseni* ranges from Southern Rhodesia and Nyasaland through Northern Rhodesia to Tanganyika and the Belgian Congo.

Acacia woodii appears to us to be another variant of *A. sieberiana,* although its author compared it only with *A. rehmanniana* and E. G. Baker did the same. As far as the pod and inflorescence are concerned *A. woodii* differs from *A. rehmanniana* in the same way as typical *A. sieberiana.* It is evident, therefore, that *A. woodii* is much more closely related to *A. sieberiana* than to *A. rehmanniana,* and this is supported by the general appearance of the foliage. *A. woodii* is very different from typical *A. sieberiana* in the copious, coarse, spreading indumentum on the branchlets and rhachides, normally strikingly golden on the young parts when dry ; in this respect only, *A. woodii* resembles *A. rehmanniana.* We consider therefore *A. woodii* to be a variant of *A. sieberiana* with a more extreme development of indumentum than the var. *vermoeseni.* In addition, while typical *A. sieberiana,* together with var. *villosa* and var. *vermoeseni,* has the pods glabrous or almost so, in var. *woodii* the pods are copiously pubescent when young and retain a certain amount of indumentum even when old. In spite of the original description of the pods as glabrous, the very juvenile ones on the type specimen (*Medley Wood* 3528, from Natal, in Kew Herbarium) are densely pubescent ; and other specimens named by the late Dr. Burtt Davy himself have pods in various stages to maturity and

and all more or less pubescent. In leaflet-size var. *woodii* appears to be more variable than the other two varieties. Its geographical area is from Natal and the Transvaal to Northern Rhodesia and Angola.

KEY TO THE VARIETIES OF *A. SIEBERIANA* WITH DENSELY HAIRY SHOOTS.

Indumentum of shoots short and rather downy, usually neither markedly golden nor villous ; fruits glabrous or nearly so, even when young :

Median leaflets of pinnae 2–2·5 mm. long, very rarely to 3 mm. (West African) . . . . var. *villosa*

Median leaflets of pinnae 3–6 mm. long (East and Central Africa) . . var. *vermoeseni*.

Indumentum of shoots much coarser, normally villous and markedly golden especially when young ; fruits densely pubescent when young and slightly so even when old (Southern Africa) var. *woodii*.

R. W. J. KEAY & J. P. M. BRENAN.

LORANTHACEAE

Loranthus belvisii *DC.*, Prodr. **4,** 303 (1830).

Loranthus lanceolatus P. Beauv., Fl. Owar. & Benin **2,** 8, t. 64 (1810?), non Ruiz et Pav., Fl. Peruv. **3,** 47, t. 278 (1802), *nom illegit.*

Although there is some doubt about the exact date of publication of *Loranthus lanceolatus* P. Beauv., at least it was not before 1808 (see Merrill in Proc. Amer. Philos. Soc. **75,** 918 : 1936), and it is therefore a later homonym. *L. belvisii* DC. was a renaming of *L. lanceolatus* P. Beauv. on account of the prior use of the latter binomial by Ruiz and Pavon ; and *L. belvisii* DC. is to be adopted as the correct name.

The name *L. lanceolatus* P. Beauv. was retained by Sprague in Dyer, Fl. Trop. Afr., **5,** pt. 1, 354–5 (1910) for the reason, now no longer a valid one, that *L. lanceolatus* Ruiz et Pav. is not now considered to be a *Loranthus.* The Flora of West Tropical Africa likewise keeps the illegitimate name, so that the present note seems required.

J. P. M. BRENAN.

RHAMNACEAE

Lasiodiscus zenkeri *Suessenguth* in Fedde, Rep. Sp. Nov. **50,** 328 (1941).

[*Lasiodiscus mannii* (non Hook. f.)—Hutch et Dalz., Fl. W. Trop. Afr. **1,** 472 (1928), pro parte, quoad spec. Preussii.].

FRENCH CAMEROONS. Yaunde, *Zenker* 695a (type in Berlin Herbarium).

A specimen which is undoubtedly a duplicate of the type gathering is in the Kew Herbarium labelled " Lasiodiscus mannii Oliv. Kamerun Preuss 695a ". This specimen was cited by Hutchinson & Dalziel under *L. mannii* Hook. f., and being a Preuss specimen, Victoria was suggested as a possible locality. It now seems clear that the specimen was distributed from Berlin with the label incorrectly written, the name Preuss replacing that of Zenker. As the species concerned came from Yaunde in the French Cameroons, the entries " ?Victoria " and " Preuss 695a " under *Lasiodiscus mannii* should be deleted from the Flora.

E. MILNE-REDHEAD.

BURSERACEAE

Commiphora mollis (*Oliv.*) *Engl.* in DC., Monogr. Phan. **4,** 23 (1883) ; Engl. in Engl., Bot. Jahrb. **48,** 472 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931) ; Burtt Davy, Fl. Transvaal, **2,** 484 (1932) ; B. D. Burtt in Kew Bull. **1935,** 108, 111 (1935).

Balsamodendron molle Oliv., Fl. Trop. Afr. **1,** 326 (1868).

Balsamea mollis (Oliv.) Engl. in Engl., Bot. Jahrb. **1,** 42 (1881).

Commiphora welwitschii Engl. in DC., Monogr. Phan. **4,** 22 (1883) ; Engl. in Engl., Bot. Jahrb. **48,** 473 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931).

Commiphora cinerea Engl. in Engl., Bot. Jahrb. **19,** 139 (1894) ; Engl. in Engl., Bot. Jahrb. **48,** 473 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931).

Commiphora stuhlmannii Engl., Pflanzenw. Ost-Afr. **C,** 230 (1895) ; Engl. in Engl., Bot. Jahrb. **48,** 474 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931) ; B. D. Burtt in Kew Bull. **1935,** 102, 108, 111 (1935).

Commiphora dekindtiana Engl. in Engl., Bot. Jahrb. **34,** 312 (1904) ; Engl. in Engl., Bot. Jahrb. **48,** 473 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931).

Commiphora heterophylla Engl. in Engl., Bot. Jahrb. **34,** 312 (1904) ; Engl. in Engl., Bot. Jahrb. **48,** 475 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931).

Commiphora montana Engl. in Engl., Bot. Jahrb. **34,** 312 (1904) ; Engl. in Engl., Bot. Jahrb. **48,** 473 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931).

Commiphora krausei Engl. in Engl., Bot. Jahrb. **44,** 152 (1910) ; Engl. in Engl., Bot. Jahrb. **48,** 472 (1912) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931) ; B. D. Burtt in Kew Bull. **1935,** 102 (1935).

Commiphora boehmii Engl. in Engl., Bot. Jahrb. **48,** 472 (1912) ; Engl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, **19a,** 435 (1931) ; B. D. Burtt in Kew Bull. **1935,** 102 (1935).

Commiphora ndemfi Engl. in Engl., Bot. Jahrb. **54,** 293 (1917) ; Engl. in Engl. & Prantl, Pflanzenfam., ed. 2, **19a,** 435 (1931) ; B. D. Burtt in Kew Bull. **1935,** 108 (1935).

The naming of Commiphoras in the neighbourhood of *C. mollis* has usually been on a basis of " hoping for the best ". While investigating some Commiphoras for Miss I. C. Verdoorn of the Division of Botany and Plant Pathology, Pretoria, South Africa, I wished to find out the limits of the species *C. mollis* (Oliv.) Engl., and the long study of the group in S. and E. Africa which followed convinced me that the above wholesale reductions to synonymy are necessary. A possible further synonym, of which I have not seen authentic material, is *Commiphora iringensis* Engl. in Engl., Bot. Jahrb. **44,** 150 (1910). All sorts of gradations link these so-called species, and while the extremes look different, even here I do not consider the characters specific. If this amalgamation is adopted *C. mollis* becomes an easily recognised species with a wide but consistent distribution, variable admittedly, but far from excessively so.

The number of leaflets varies from 2–6 pairs, and there is a wide range of size.

C. mollis, in its new sense, has been found in Tanganyika Territory, Portuguese East Africa, Nyasaland, N. and S. Rhodesia, Bechuanaland, Angola, South-west Africa and the Transvaal.

J. P. M. BRENAN.

OLEACEAE

Jasminum fluminense *Vell.*, Fl. Flumin. 10 (1825) ; op. cit., Atl. **1**, t. 23 (1827).

Jasminum abyssinicum R. Br. in Salt, Voy. Abyssin., App. 63 (1814), *nom. nud.* ; non *J. abyssinicum* Hochst. ex DC. (1844).

Jasminum mauritianum Boj. [Hort. Maurit. 204 (1837), *nom. nud.*] ex DC., Prodr. **8**, 310 (1844) ; Bak. in Dyer, Fl. Trop. Afr. **4**, 1, 10 (1902).

Jasminum bahiense DC., tom. cit. 311 (1844), *nom. illegit.*

[*Jasminum azoricum* (non L.).—Eichl. in Mart., Fl. Brasil. **6**, pars. 1, 315, t. 84, fig. 1 (1868). Urb. Symb. Antill. **8**, 534 (1921). Britton & Wils. in Sci. Surv. Porto Rico & Virgin Is. **6**, 80 (1925).].

This species, which has a wide distribution in tropical Africa and the Mascarene islands, is established in the West Indies as well as on the mainland of tropical America in Brazil. In works on the flora of tropical Africa, where the species is indigenous, the name in general use for it is *J. mautitianum*, based on material from Mauritius. *J. bahiense*, described by De Candolle simultaneously with *J. mauritianum*, is the same species introduced into Brazil. In point of fact the name *J. bahiense* is illegitimate, as De Candolle included under it (as a variety) the earlier *J. fluminense* which Velloso had described from Brazil in 1825. The plate which Velloso subsequently published to illustrate his species shows the corolla-tube too short, but this, as suggested by De Candolle, must have been due to a graphical error as the plate can scarcely represent anything but the species under discussion. Eichler in 1868 treated *J. bahiense* and *J. fluminense* as synonymous, but wrongly referred them to *J. azoricum* L. a species from which the Brazilian plant is very different. Workers on West Indian botany have followed Eichler in using the erroneous name *J. azoricum*. The valid name for this tropical African species established in America is *J. fluminense*.

J. E. DANDY.

ASCLEPIADACEAE

Ceropegia brosima *Bruce et Bally*, sp. nov. ; quoad habitum scandentem et tuberum corollaeque indolem *C. debili* N.E.Br. affinis, sed foliis longioribus, coronae lobis interioribus linearibus (nec oblanceolatis), corona exteriore majore differt.

Herba scandens, usque 60 cm. alta. *Tuber* depresso-sphaericum, 4–6 cm. diametro, 3 cm. altum. *Caulis* parce ramosus, glaber, teres, basi 2–3 mm. diametro. *Folia* patentia, subsessilia vel breviter petiolata ; lamina linearis, glabra, circiter 3 cm. longa, 3 mm. lata, apice acuta et

apiculata, basi cuneata, nervo medio subtus prominente supra impresso. *Cymae* 5–6-florae, e nodis lateraliter ortae, floribus seriatim expensis ; pedunculus circiter 6 mm. longus ; pedicelli 4 mm. longi. *Calycis* lobi late deltoidei, 1 mm. longi, basi 0·5 mm. lati, glabri, apice acuminati. *Corolla* circiter 2·4 cm. longa ; tubus basi globoso-inflatus, 5 mm. diametro, deinde constrictus et per 10 mm. cylindricus, 2 mm. diametro, intus pilis paucis ornatus, apicem versus infundibuliformis, fauce 5 mm. diametro ; lobi erecti, apice connati, e basi deltoidea late lineares, replicati, 6 mm. longi, basi 2 mm. lati, apice rotundati, pilis purpureis ciliati. *Corona* duplex, glabra ; lobi exteriores basi breviter connati, plus minusve cupuliformes, apicem versus liberi, patuli, poculiformes, 0·75 mm. alti, margine undulato-crenulati ; lobi interiores lineares, erecti, circiter 2·25 mm. longi, primo conniventes, demum apice recurvati.

Kenya Colony. Kisumu District, Onjiko, about 1140 m., Dec. 1941, *Boy Opiko* (*Bally* S. 83) (type) :—tubers flat compressed discs, eaten raw by natives.

This little climber has pale greenish-white flowers finely spotted with pale purple in the lower part, becoming darker above, with the throat and base of the lobes deep maroon, whilst the tips of the lobes are green with very minute purple dots and ciliate with pale purple hairs.

A specimen found by Mrs. Copley (*Bally* S.93) in Nairobi is probably a form of *C. brosima.* It is similar to it in habit and in the shape and structure of the corolla, but rather larger. The chief difference is that the outer corona-lobes are larger and distinctly 2-horned. The specific epithet *brosima* (Gk. βρωσιμος), meaning edible, refers to the tubers. Measurements have been taken from spirit material.

E. A. Bruce & P. R. O. Bally.

Ceropegia copleyae *Bruce et Bally*, sp. nov. ; quoad structuram coronae et faciem corollae *C. crassifoliae* Schltr. affinis, sed habitu erecto, foliis semiteretibus, floribus minoribus valde distincta.

Herba erecta, carnosa, usque 14 cm. alta. *Caulis* simplex, glaber, carnosus, cylindricus, basi 3–4 mm. diametro, internodiis 5–7 mm. longis. *Folia* suberecta, sessilia, carnosa, glabra, semiteretia, 4–6·5 cm. longa, 4–5 mm. lata, 3 mm. crassa, supra plana nervo medio impresso, subtus convexa nervo medio subprominente, apice subacuta et apiculata, basi cuneata. *Inflorescentiae* ex axillis foliorum pedunculatae, 3–5-florae, floribus seriatim expansis ; pedunculi carnosi, simplices vel ramosi, circiter 1 cm. longi, basi 2 mm. diametro ; pedicelli circiter 6 mm. longi. *Bracteae* parvae, deltoideae, vix 1 mm. longae. *Calycis* lobi lanceolati, circiter 2·5 mm. longi, basi 1 mm. lati, apice acuminati. *Corolla* circiter 1·3 cm. longa, extra glabra ; tubus basi subglobosus, 4 mm. diametro, deinde abrupte constrictus et per 5·5 mm. cylindricus, 2 mm. diametro, fauce vix ampliatus, intus parce pubescens ; lobi carnosi, 3·5 mm. longi, basi 2 mm. lati, plus minusve oblongi, apice subacuti, dorso medio longitudinaliter canaliculati, intus superne 2/3 lamina incrassati, pilis longis setaceis albidis ornati. *Corona* duplex, breviter stipitata ; lobi exteriores poculiformes, poculis fauce 1 mm. latis 1·3 mm. altis apice rotundatis emarginatis ; lobi interiores cum exterioribus alternantes, late lineares, circiter 1 mm. longi, apice rotundati vel paullo dilatati, super antheras subhorizontaliter incumbentes apicibus haud tingentibus.

KENYA COLONY. Kiambu, 15 miles East of Nairobi, in shallow soil in half-shade, about 1800 m., March 1941, *Mrs. Kathleen Armstrong* (*Bally* S. 44) (type).

This inconspicuous plant is characterized by its unusual leaves, which are comparable to those of some species of *Mesembryanthemum.* The flowers are small and uniformly green in colour, so that the species is easily overlooked. The plant was originally discovered by Mrs. Copley growing in her garden at Nairobi but was not fully developed. Later the following year mature plants were found by Mrs. Armstrong at Kiambu, and it is from these that the above description has been drawn up, the measurements being made from spirit material.

E. A. BRUCE & P. R. O. BALLY.

Ceropegia evelynae *Bruce et Bally,* sp. nov. ; affinis *C. succulentae* E. A. Bruce, sed corollae lobis longioribus superne multo angustioribus structuram asymmetrico-curvatam apertam efformantibus, tubo basi obovoideo-inflato, foliis anguste oblongo-ellipticis differt.

Herba perennis, scandens, circiter 2 m. alta, radicibus fibrosis. *Caulis* carnosus, simplex vel sparse ramosus, glaber, basi teres, circiter 7 mm. diametro, internodiis 12–24 cm. longis. *Folia* glabra, patentia, petiolata ; petioli circiter 8* (12) mm. longi, supra canaliculati ; lamina carnosa, anguste oblongo-elliptica, circiter 5* (8) cm. lata, 1·6* (3·3) cm. lata, apice subacuta, basi cuneata, subtus nervo medio prominente et carinato, nervis lateralibus indistinctis. *Inflorescentiae* ex axillis foliorum 4–6 cm. pedunculatae, 2–3-florae, floribus seriatim expansis ; pedicelli 1–1·5 cm. longi. *Calycis* lobi plus minusve lineares, circiter 5* (7) mm. longi, glabri, apice leviter recurvati. *Corolla* circiter 5* (6) cm. longi ; tubus basi per 1·4 cm. obovoideo-inflatus et infra apicem 1·2 cm. diametro, deinde abrupte constrictus et per 1 cm. cylindricum, 4 mm. diametro, apicem versus dilatatus et per 1·4 cm. infundibuliformis, fauce 1·6 cm. diametro, extra glaber, intus infra constrictionem setis retrorsis instructus ; lobi in structuram asymmetrico-curvatam apice cohaerentes, e basi deltoidea lineares, replicati, 2·5 cm. longi, basi 1 cm. lati, marginibus triente superiore aperte replicatis, inferius omnino complanato-replicatis, margine pilis albidis et purpureis ciliati. *Corona* duplex ; lobi exteriores basi in cupulam circiter 2 mm. altam fauce 3·5 mm. diametro extra parce hispidam intus glabram connati, lobis apice bicornutis, cornubus loborum adjacentium approximatis linearibus recurvo-patentibus hispidis circiter 1 mm. longis ; lobi interiores clavati, erecto-conniventes, circiter 2·2 mm. longi, apice subtruncati, 1 mm. lati, basi 0·5 mm. lati, glabri.

UGANDA. Toro District, Fort Portal, Kilcloony Crater Lake, about 1500 m., scrambling in undergrowth at the water's edge, July 1944, *Mrs. E. Forbes* 65 (*Bally* S. 158) (type) :—corolla with a greenish white bulbous base, expanded part white with purple spots, lobes bright almond green at the base shading to yellow and becoming purplish maroon at the tips.

This attractive fleshy climber with its dark shiny green leaves and large flowers is named in honour of Mrs. Evelyn Forbes, the collector.

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*These measurements refer to dried material, the measurements in brackets are taken from spirit material.

A part of the gathering from which the original dried specimen was made, has been cultivated in Nairobi by one of us (P.R.O.B.), and it is from this plant that the measurements of the spirit material have been obtained.

C. evelynae is very near *C. succulenta* E. A. Bruce, but differs mainly in the longer and narrower corolla lobes, which are bent over at the top, and in the leaves which are narrower and tapered to the base and apex. A plant collected by Dr. van Someren in the Emali Hills, near Kibwezi, Kenya Colony (*Bally* S.70) is very similar to *C. evelynae* in the form of the corolla, but approaches *C. succulenta* in the leaf shape. The coronal structure is midway between the two species. It is therefore possible that the plant may be a hybrid between *C. evelynae* and *C. succulenta*.

E. A. BRUCE & P. R. O. BALLY.

Ceropegia helicoides *Bruce et Bally*, sp. nov. ; quoad habitum scandentem et folia plus minusve carnosa florumque indolem, *C. evelynae* Bruce et Bally affinis, sed corollae lobis elongatis tortuosis, calycis lobis longissimis valde distincta.

Herba perennis, scandens, usque 2 m. alta, radicibus fibrosis. *Caulis* carnosus, glaber, teres. *Folia* plus minus carnosa, breviter petiolata ; petioli circiter 1 cm. longi ; lamina oblongo-ovata, circiter 8·4 cm. longa, 4·6 cm. lata, apice subrotundata et apiculata, basi rotundata, nervo medio subtus prominente supra impresso, nervis lateralibus utrinsecus 7, margine parce ciliata. *Inflorescentiae* exaxillis foliorum 1–3-florae, floribus seriatim expansis ; pedicelli 1·5–3 cm. longi. *Calycis* lobi lineari-subulati, patuli, 2–2·9 cm. longi, basi 2·2–3·1 mm. lati, margine ciliati, corollae basin inflatam paullo superantes. *Corolla* circiter 9·8 cm. longa ; tubus basi per 1·35 cm. inflato-orchiformis 1 cm. diametro, deinde abrupte constrictus et leviter depressus, per 5 mm. cylindricus et 4 mm. diametro, apicem versus per 1·4 cm. dilatato-infundibuliformis et fauce 1·2 cm. diametro ; lobi e basi deltoidea sensim angustati, 6·4 cm. longi, replicati, sinubus interioribus per 3 cm. continuis pocula elongata tenuiter pilosa efformantibus, superne per 3·4 cm. liberi, tortuosi, margine pilis pallido-purpureis ciliati. *Corona* duplex, glaber ; lobi exteriores basi in cupulam 1·5 mm. altam connati, lobis apice bicornutis, cornubus lineari-subulatis erectis circiter 1·5 mm. longis superne per paria propria contiguis ; lobi interiores lineares, erecto-conniventes, circiter 4 mm. longi, apice rotundati.

KENYA COLONY. Northern Frontier Province. Matthew's Range, Febr. 1945, *Mrs. Joy Adamson* (*Bally* S. 153) (type).

This is a fleshy climber similar in habit to *C. succulenta* E. A. Bruce. The large elongate flowers have a pale greenish-white corolla tube marked with small maroon spots, the lobes are pale green at the base becoming white and are finely dotted with maroon, the spirally twisted tips are deep purple-maroon.

A specimen collected in Mtuwambu, Tanganyika, appears to be intermediate between this species and *C. evelynae* Bruce and Bally, having the spiral lobes and long sepals of *C. helicoides* but the funnel-shaped tube and rounded inflation of *C. evelynae*.

Measurements in the description have been taken from spirit material.

E. A. BRUCE & P. R. O. BALLY.

Ceropegia imbricata *Bruce et Bally*, sp. nov. ; affinis *C. vignaldianae* A. Rich., sed foliis ovatis carnosis differt.

Herba erecta, 8–10 cm. alta, radice tuberosa. *Caulis* simplex, teres, glaber, basi 2 mm. diametro, internodiis 7–14 mm. *Folia* suberecta, glabra, carnosa, petiolata, petiolis circiter 3 mm. longis superioribus minoribus ; lamina ovata, 1–2·3 cm. longa, 0·5–1·2 cm. lata, 1·5–2 mm. crassa, supra concava, subtus subconvexa, apice acuminata basi rotundata vel cuneata, margine et supra pilis papillosis albidis paucissimis ornata, nervis indistinctis. *Inflorescentiae* 1–2-florae, e nodis lateraliter ortae ; pedunculus circiter 2 mm. longus ; pedicelli 2·5–4 mm. longi. *Calycis* lobi lanceolati, circiter 2 mm. longi, basi 0·75 mm. lati, apice acuminati et recurvati. *Corolla* circiter 1·7 cm. longa ; tubus basi inflato-globosus 5 mm. diametro, intus minute et parce verrucosus, deinde per 7 mm. abrupte constrictus anguste cylindricus et 2 mm. diametro, infra apicem ampliatus fauce 5 mm. diametro ; lobi replicati, erecti, apice connati, late lineares, 5 mm. longi, apice rotundati, margine pilis longis purpureis ciliati, ceterum glabri. *Corona* duplex, glabra, lobi interiores 1·4 mm. lati ; basi in cupulam brevem 1 mm. altam fauce 3 mm. diametro margine undulatam connati ; lobi interiores erecto-conniventes, subulati, 2·3 mm. longi, apice paullum recurvo-patentes.

KENYA COLONY. Nairobi, growing in shallow black cotton soil, 5 July 1940, *Mrs. Copley* (*Bally* S. 48) (type).

This attractive little plant has rather closely set, over-lapping, dark green leaves and greenish-white flowers with maroon tips. The available spirit material has immature flowers, so the floral measurements in the description have been made from a photograph of the original plant of which the spirit material is a part. The specific epithet *imbricata* refers to the overlapping leaves.

E. A. BRUCE & P. R. O. BALLY.

RUBIACEAE

Galium scioanum *Chiov.* in Ann. Bot., Roma **9**, 322 (1911).

ABYSSINIA. Scioa Province. In marshy places near the tomb of Finfinni in Addis Ababa, alt. 2400 m., 8 June 1909, *G. Negri* 1410 (typus in Herb. Florent.).

KENYA. Central Province, Fort Hall District. Kinangop, alt. 2130 m., Sept, 1934, *Mrs. Albrechtsen* (*Coryndon Museum* no. 6717).

TANGANYIKA TERRITORY. Southern Highlands Province. Njombe District. North of the upper Ruhudje R., Lupembe area, May 1931, *Schlieben* 896. Msima Stock Farm, 1932, *Emson* 279 :—annual creeper 60 cm. long with white flowers, common in vleis and by riversides.

var. **glabrum** *Brenan*, var. nov. ; planta omnino glabra vel fere glabra nec pubescens.

[*Galium mollugo* (non L.).—K. Schum. in Warb., Kunene-Sambesi Exped. 394 (1903) ; R. Good in Journ. Bot. **65**, suppl. 2, 43 (1927)].

[*Galium spurium* (non L.).—Hutch. et Bruce in Kew Bull. **1941**, 150 (1941)].

ABYSSINIA. Harar Province : Galla Pass, by stream, alt. 2320 m., 24 Febr. 1933, *Gillett* 5200 :—flowers white.

KENYA. Rift Valley Province. Trans-Nzoia District. Uasin Gishu, damp ground by river, alt. 2130 m., *Miss Harvey* 103 :—herb, semi-prostrate ; flowers white.

TANGANYIKA. Southern Highlands Province. Iringa District. Iheme, in a marshy bottom, alt. 1830 m., 28 Jan. 1934, *Michelmore* 934 :—flowers white.

NORTHERN RHODESIA. Mwinilunga District. R. Lunga just below R. Mudjanyama junction, among grass and herbs in open on river bank, 25 Nov. 1937, *Milne-Redhead* 3401 (typus varietatis in Herb. Kew.) :—erect perennial ; leaves reflexed ; corolla 4-lobed, white.

ANGOLA. Bié District. On the Longa near Napalanka, alt. 1250 m., 28 Dec. 1899, *Baum* 589. Chipumba Rivulet, Cuelai, *Gossweiler* 3515.

The African bedstraws are often very difficult to disentangle, a condition not unknown in this genus in other parts of the world. Hitherto *G. scioanum* Chiov. has been known only from its Abyssinian type, but is now shown to cover plants ranging as far to the south as Angola which have been scattered about in herbaria under a rather shocking assortment of names.

G. scioanum has white flowers and differs in this from the yellow-flowered *G. scabrellum* K. Schum. and *G. mollicomum* Bullock, which may otherwise be superficially rather like it. *G. mollicomum* differs in addition in habit, and *G. scabrellum* in the reflexed teeth on the leaf-margins, and both in their smaller flowers.

Among the non-yellow-flowered African bedstraws, *G. scioanum* differs from *G. simense* Hochst. ex A. Rich., non Fresen., in the much more robust habit, the strong tendency in the leaves to become reflexed, in the many-flowered cymes, white not purplish flowers, and smaller fruits. *G. stenophyllum* Baker is probably the closest African relative but differs in habit and in the linear non-reflexed leaves ; in *G. scioanum* the leaves are usually lanceolate and seem not to be parallel-sided ; they are also normally shorter than in *G. stenophyllum.*

Although *G. scioanum* var. *glabrum* has been misidentified with *G. mollugo* L., there is not really much similarity. On the other hand the var. *glabrum* is extremely like the European *G. palustre* L., particularly its var. *witheringii* (Sm.) Bab. Besides the difference in geography (*G. palustre* is not known from tropical Africa) the most obvious separating character is the leaf-tip, blunt in *G. palustre*, but with a short, deflexed, rather abrupt but decidedly acute point in *G. scioanum.*

The type of *G. scioanum* is densely pubescent and looks very different from that of var. *glabrum*, but except for some variation in robustness this is entirely due to the amount of pubescence. The presence of very slight pubescence on *Michelmore* 934, and the fact that *Albrechtsen* 6717 comes almost midway between the extremes of the type and var. *glabrum* convinces me that to pay but little attention to the amount of pubescence in this species is the right thing to do.

J. P. M. BRENAN.

COMPOSITAE

FELICIA EYLESII S. Moore in Journ. Bot. **64**, 304 (1926).

As a result of information received from Dr. H. Wild, of the Department of Agriculture and Lands, Southern Rhodesia, Kew specimens named *Felicia eylesii* S. Moore have been re-examined, and are found to include two distinct species, one indistinguishable from *F. homochroma* S. Moore, the other (including type *F. eylesii*) apparently conspecific with *F. barbellata* S. Moore. Both species are slender, erect, annual herbs, remarkably alike superficially, though readily distinguished, on closer examination, by the characters set out below :—

Pappus *distinctly plumose* ; leaves entire or almost entire, peduncles glandular-pilose ; ray florets at first white or pink, later red or purple . . . . 1. *F. barbellata*

Pappus *minutely scabrid* ; leaves usually denticulate, peduncles glabrous or shortly glandular ; ray florets at first yellow, later orange-red or purple . . . . 2. *F. homochroma*

1. **Felicia barbellata** *S. Moore* in Journ. Linn. Soc. Bot. **37,** 314 (1906).

F. eylesii S. Moore in Journ. Bot. **64,** 304 (1926).

Aster eylesii (S. Moore) Milne-Redhead in Hook. Ic. Pl. **33,** sub t. 3243, p. 2 (1934).

SOUTHERN RHODESIA. Salisbury, May 1911, *Albany Museum, Grahamstown* no. 26 (no collector given). Rua River near Salisbury, in *Brachystegia* bush, 1500 m., June 1918, *Eyles* 1335 (type of *F. eylesii*) :—erect ; open flowers [with] white to pink rays and yellow centre. Salisbury, 1 May 1932, *Eyles* 7143 :—small herb ; ray dark red.

NORTHERN RHODESIA. Broken Hill District. Johnston's Farm near Broken Hill, on sandstone, c. 1200 m., May 1909, *Rogers* 8108. Serenje District, 32 Km. SW. of Serenje Corner, 1590 m., *Hutchinson & Gillett* 3705 :—[heads] purple. Mpika District. 108 Km. NE. of Serenje Corner, in *Brachystegia* woodland, 16 July 1930, *Hutchinson & Gillett* 3752 :—flowers pale blue or crimson. Mumbwa District. Mumbwa, *Macaulay* 841 :—small yellow or red " thistle " with dark red anthers.

ANGOLA. Malange District. Pomça Uremba near Malange, in shady spots or in open woods, 26 June 1902, *Gossweiler* 1150 (type of *F. barbellata*) :—a weak annual, 6–9 dm. high, branched towards the top ; ray flowers white, but soon fading with disk flowers becoming more prominent, scarlet-red.

Spencer Moore seems to have overlooked *F. barbellata* when describing *F. eylesii* ; he compares the latter with *F. abyssinica* Sch. Bip., a very distinct species, without commenting on the much more obvious affinity with *F. barbellata.* Moreover *F. eylesii* is described as having scabrid pappus, though in the type the pappus is distinctly plumose.

2. **Felicia homochroma** *S. Moore* in Journ. Bot. **59,** 229 (1921).

[*Aster crenulatus* Hutch., Botanist in S. Afr. 484 (1946), *nomen nudum.*].

BELGIAN CONGO. Katanga Province. Elisabethville, *Rogers* 26220 (type). Kasombo, Elisabethville, 1934, *Quarré* 4142.

TANGANYIKA. Rungwe District. Near Kymbila, 9 July 1912, *Stolz* 1436.

NYASALAND. Kota-Kota District. Nchisi Mt., plentiful in shallow seepage-soil in *Brachystegia* woodland, 1400 m., 24 July 1946, *Brass* 16915 : herb 10–30 cm. high.

Northern Rhodesia. Livingstone District. Zimba, 1200 m., 10 July 1930, *Hutchinson & Gillett* 3509 :—[heads] yellow-orange. Broken Hill District. About 45 Km. SW. of Broken Hill, in *Brachystegia* woodland, 1140 m., 13 July 1920, *Hutchinson & Gillett* 3604 :—[heads] dark yellow. Mukushi District. 8 Km. E. of Chiwefwe, in *Brachystegia* woodland, 1350 m., 15 July 1930, *Hutchinson & Gillett* 3676 :—[heads] yellow turning orange. Mumbwa District. Near Mumbwa, *Macaulay* 333 :—[heads] yellow-brown. Ndola District. Mufulira, in open forest, 2 May 1934, *Eyles* 8265 :—flowers yellow ; tips of inner segments of involucre red. Mufulira, as above, 17 May 1934, *Eyles* 8327 :—contrasted red flowers and yellow flowers on one plant. Solwezi District. On dry bare ground in *Brachystegia* woodland at Solwezi, 4 June 1930, *Milne-Redhead* 418 :—erect annual weed ; flowers yellow ; rays turning purplish in age.

I can find no published description of *Felicia crenulata* Mattf., though the name appears on a specimen of *F. homochroma* from Tanganyika (*Stolz* 1436) ; *Aster crenulatus* Hutch. is apparently based on this MS. name.

The leaves and stems of *F. homochroma* turn red or purple on drying, whilst specimens of *F. barbellata* do not show this discolouration.

R. D. Meikle.

Emilia praetermissa *Milne-Redhead*, sp. nov., affinis *E. coccineae* Curt., sed folis valde dentatis, capitulis longioribus et angustioribus et floribus lacteis differt.

Herba annua, usque 9 dm. alta. *Caules* erecti vel adscendentes, simplices vel basi ramosi, inferne leviter pilosi, superne glabri ; internodia basin versus 0·6–2·0 cm. longa, superne usque 9 cm. longa. *Folii* infimi lamina late ovata, subcordata, in petiolum attenuata, margine angulata, 4·0 cm. longa, 4·5 cm. lata ; petiolus 1·5–2·5 cm. longus, parce pilosus, exalatus et exauriculatus ; foliorum inferiorum (2–3) lamina late ovata, subcordata, in petiolum attenuata, margine valde dentata, circiter 6 cm. longa et 6 cm. lata ; petiolus 2–3 cm. longus, alatus, exauriculatus, parcissime pilosus ; folia caulis medium versus sita inferioribus simila sed basi conspicue auriculata, auriculis alisque valde dentatis ; folia superiora sessilia, auriculato-cordata, plus minusve deltoidea, margine conspicue dentata, inferne ad costam parce pilosa. *Capitula* erecta, 3–4 in cymam disposita ; bracteae anguste lanceolatae, apice attenuatae, 8–11 mm. longae, basin versus saepe unidentatae, conspicue pilosae ; capitulae sub anthesin in toto 15 mm. longa, basi 4 mm., medium versus 3 mm. et apice 8–9 mm. diametro ; involucri bracteae circiter 12, circiter 10 mm. longae, inferne glabrae, superne parce pilosae. *Flores* tubulosae ; corollae tubus 8 mm. longus ; lobi 2 mm. longi, adscendentes. *Antherae* 1·7 mm. longae, apice appendiculatae. *Styli* rami circiter 1·2 mm. longi, recurvati, apice extra minute hispidi, haud appendiculati. *Ovarium* 2·5 mm. longum, 5-costatum, costis adpresse papilloso-hirsutis. *Pappus* circiter 7 mm. longus, minute barbellatus. *Achaenia* angustissime truncato-ellipsoidia, 3 mm. longa, 5-costata, costis hispidis.

Sierra Leone. Common weed, Hill Station, Freetown, 30 Dec. 1926, *Deighton* 489 :—herbaceous, 9 dm. high ; flowers pale yellow.

Heddle's Farm, Freetown, weed, 8 May 1928, *Deighton* 1188 (type) :—flowers pale yellow. Regent Reservoir, Freetown, 30 Apr. 1949, *H. C. King* 182, 182B :—herb up to 6 dm. high ; florets pale pinkish white. Wellington, weed in empoldered area of tidal *Avicennia* swamp, 22 Febr. 1949, *Deighton* 4984 :—3–6 dm. high.

NIGERIA. Agege Agricultural Experimental Station, near Lagos, 28 Apr. 1948, *J. T. Baldwin* 11981. Abeokuta Province. Olokemeji Forest Reserve, Nov. 1945, *Jones, Keay & Onochie, in For. Herb., Ibadan* 4943 :—flowers cream with orange anthers.

My attention was first called to this species by Dr. J. T. Baldwin Jr., of William and Mary College, Virginia, who collected specimens and seed of it in Nigeria in 1948. Cytological examination of this gathering showed it to have a 2n-number of 20 chromosomes, whilst the number found in the common West African species, *E. coccinea*, is 2n=10. Further specimens of what appeared to be the same species were found in the covers of *E. coccinea* at Kew. These were both from Freetown, collected by Mr. F. C. Deighton over 20 years ago. I mentioned this plant to Mr. Deighton when he was home on leave, and he took steps to obtain further specimens and ripe seed through Mr. H. C. King of the Sierra Leone Forest Department. This seed was sent to Dr. Baldwin who has confirmed that the Sierra Leone plant agrees with his Lagos gathering in having the 2n-number=20 (See Baldwin and Speese in Bull. Torr. Bot. Club **76**, 348–51 : 1949).

The colour of the flowers appears to be very characteristic. The corolla is mainly cream-coloured with a mauve tinge at the very tips of the segments scarcely noticeable to the naked eye. The anthers are orange red, the pollen is golden yellow, and the style-arms are buff with bright red tips to the arms.

E. MILNE-REDHEAD.

Crassocephalum bauchiense (*Hutch.*) *Milne-Redhead*, comb. nov.

Gynura caerulea Hutch. et Dalz., Fl. W. Trop. Afr. **2**, 147–8 (1931), non O. Hoffm. (1893), *nom illegit.*

Gynura bauchiensis Hutch. in Hutch. et Dalz., Fl. W. Trop. Afr. **2**, 608 (1936).

C. bauchiense, hitherto known only from Nigeria, has now been found in the Mwinilunga District of Northern Rhodesia (*Milne-Redhead* 4435) and in Mubende, Uganda (*A. S. Thomas* 4320).

E. MILNE-REDHEAD.

Crassocephalum montuosum (*S. Moore*) *Milne-Redhead*, comb. nov.

Senecio montuosus S. Moore in Journ. Linn. Soc. Bot. **36**, 354 (1902).

Crassocephalum bumbense S. Moore in Journ. Linn. Soc. Bot. **47**, 279 (1925).

Gynura montuosa (S. Moore) Bullock in Bull. Misc. Inform. Kew **1932**, 499 (1932).

This species, like several other species of *Crassocephalum*, is very variable in leaf-shape. I consider *C. afromontanum* R. E. Fries may be merely an extreme variety with entire leaves rather suddenly narrowed into the petiole, and fewer capitula, but I await further gatherings and fuller information before coming to a definite conclusion regarding its status.

In herbaria *C. montuosum* has been much confused with *C. crepidioides* (Benth.) S. Moore.

E. MILNE-REDHEAD.

Crassocephalum baoulense (*A. Chev.*) *Milne-Redhead*, comb. nov.

Senecio baoulensis A. Chev. in Bull. Soc. Bot. Fr. **61,** Mém. **8,** 260 (1917).

Gynura baoulensis (A. Chev.) Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 148 (1931).

An excellent gathering of this apparently local species has been received from the Gold Coast (*Vigne in Forest Herb.* 3470), where it was growing in damp places in savannah forest at Ejura, Ashanti.

E. MILNE-REDHEAD.

Crassocephalum mannii (*Hook. f.*) *Milne-Redhead*, comb. nov.

Senecio mannii Hook. f. in Journ. Linn. Soc. Bot. **6,** 14 (1862).

Senecio multicorymbosus Klatt in Ann. Naturh. Hofmus. Wien **7,** 103 (1892).

Senecio acervatus S. Moore in Journ. Linn. Soc. Bot. **40,** 121 (1911).

Crassocephalum multicorymbosum (Klatt) S. Moore in Journ. Bot. **50,** 211 (1912).

Whilst the size of the capitulum, the number of involucral bracts and the degree of indumentum of the leaves varies considerably from specimen to specimen, these characters do not appear to be correlated, nor are they related to any particular geographical area. In view of this I am unable to retain *Crassocephalum multicorymbosum* as a species distinct from *C. mannii.*

It is strange that *C. mannii* appears never to have been recognized as belonging to *Crassocephalum* nor to *Gynura* in the broad sense, especially as *Senecio multicorymbosum* was referred to *Crassocephalum* by Spencer Moore as long ago as 1912.

E. MILNE-REDHEAD.

GENTIANACEAE

Exochaenium pygmaeum *Milne-Redhead*, sp. nov. affinis *E. pumilo* (Bak.) A. W. Hill, a qua foliis minoribus, filamentis antheras cum glandulis apicalibus plus minusve aequantibus, glandula apicali plus minusve antheram aequilonga, anthera basi biglandulosa distinguenda.

Herba annua vel fortasse perennis, erecta, 3·0–5·5 cm. alta, glabra. *Caules* 1–3, simplices vel ramosi, 4-alati, foliosi ; internodia 2·5–8·0 mm. longa. *Folia* sessilia, late ovata, basi rotundata, margine in alam caulis decurrentia, apice acuta vel apiculata, usque 4 mm. longa et 3·5 mm. lata, sed saepe minora. *Flores* in cymas pauci- vel multifloras densiuscule dispositi, in toto 7·5–8·0 mm. longi, 5- vel interdum 6-meri ; pedicelli 0·3–1·3 mm. longi. *Calyx* circiter 4 mm. longus ; segmenta lanceolata, acuta, dorsaliter valde alata, ala infra medium latissima, basi paullum connata, intus basin versus annulo squamarum instructa. *Corolla* anguste infundibuliformis ; tubus 3·5–4 mm. longus ; lobi anguste obovati, obtusiusculi, 2·5–3 mm. longi. *Stamina* infra medium corollae tubum orta ; filamenta circiter 1·3 mm. longa ; antherae circiter

0·7 mm. longae, apice uniglandulosae, glandula 0·7 mm. longa minute papillosa, basi glandulis duobus minutis instructae. *Ovarium* compresso-ellipsoideum, circiter 1·2 mm. altum ; stylus circiter 1·2 m. longum ; stigma elongatum, dense et conspicue papillosum, demum bifidum. Fructus mihi ignotus.

NORTHERN RHODESIA. Mwinilunga District. Sinkabolo Dambo, in boggy not waterlogged grassland, 9 Dec. 1937. *Milne-Redhead* 3579 :—very dwarf, ? annual ; roots rather fleshy; stems and leaves pale green ; calyx with keeled lobes, pale green ; corolla white with yellow tube.

Exochaenium pygmaeum is very similar in appearance to *E. pumilum* (Bak.) A. W. Hill, a species based on a specimen collected by Barter (no. 1680) on Dr. Baikie's Niger Expedition, 1857–59, at Nupe in Nigeria. The description is exceedingly poor, and no mention is made of the length of the stamens or the size of the anthers. Hill (Bull. Misc. Inform. Kew **1908,** 336 : 1908) calls attention to the presence of heterostyly in certain species of *Exochaenium.* It appears, however, to be confined to the species with relatively large and showy flowers, and there is no evidence to suggest that it occurs either in *E. pumilum* or *E. pygmaeum.* In both these species the anthers in every flower that I have examined have been held level with and closely surrounding the stigma, suggesting that the flowers may be self-pollinated. It therefore seems that the relative lengths of the filaments, the anthers and their apical glands are likely to be sound diagnostic characters.

E. MILNE-REDHEAD.

CAMPANULACEAE

Cyphia erecta *De Wild.*, Ann. Mus. Cong., sér. IV, **1,** 162 (1902).

Cyphia scandens De Wild., Ann. Mus. Cong., sér. IV, **1,** 163 (1902).

BELGIAN CONGO. Katanga Province. Lukafu, Dec. 1899, *Verdick* 345 (type of *C. erecta* in Brussels Herb.). Lukafu, Febr. 1900, *Verdick* 368 (type of *C. scandens* in Brussels Herb.).

NORTHERN RHODESIA. Kawambwa District. Mbereshi, fairly common in grassy plains, 1170 m., Mar. 1932, *E. G. Walter* 16 :—flowers white, without scent. Ndola District. Mufulira, in woodland, 30 Nov. 1947, *Cruse* 87 :—flowers mauve ; do., 3 Jan. 1948, *Cruse* 225. Mwinilunga District. Without locality [probably Kalene Hill], *J. M. Marks* s.n. Kalenda Dambo, N. of Matonchi Farm, in "lateritic" grassland in open, not in bog, 10 Dec. 1937, *Milne-Redhead* 3593 :—stems erect or twining from tuberous rootstock, purplish ; leaves green with purple margin ; corolla deep bright purple, paler underneath and at throat.

The plant collected by me in Northern Rhodesia was found to be conspecific with a number of unnamed gatherings of a *Cyphia*, also from Northern Rhodesia. Examination of the descriptions of *C. erecta* De Wild. and *C. scandens* De Wild. left me in doubt as to which of these species the Kew material should be referred. The chief difference appeared to be one of habit, *C. erecta* being described as a herbaceous plant more than 20 cm. high, whilst *C. scandens* was said to be a small climbing plant. Apart from this, the descriptions agreed in everything

but the size of the flowers, those of *C. scandens* being distinctly smaller than those of *C. erecta.* The habit character was shown by my gathering to be unsound. One of my plants has a lateral branch twining up the erect main branch of the same individual !

Examination of the two type specimens has been made possible through the kindness of Prof. W. Robyns, Director of the State Botanic Gardens at Brussels. Careful comparison of them with the five gatherings at Kew convinces me that they represent but one somewhat variable species. Apart from habit and flower-size, the size and shape of the leaves and their degree of toothing are other variables. I have tabulated the values of three characters for a number of the specimens examined, and it will be seen that there is no significant correlation between these figures.

	Cruse 225	*Marks*	*Verdick* 345	*Verdick* 368	*Walter* 16	*M.-R.* 3593
Narrowest leaf (mm.)	12	4	6	5	6	4
Widest leaf (mm.) ...	24	11	9	11	10	14
Length of corolla (mm.)	14	12–15	12	9	13	10–13

Cruse 225 is a strikingly wide-leaved form, but in other respects is quite typical of *C. erecta.* The type of *C. scandens* is in my opinion a late season condition, showing a marked twining tendency due probably to its growing among taller grass, whilst its lateness might well account for its smaller flowers. It is clear that the type of *C. erecta* is the more normal form of the species, and I accordingly retain that name for the species, although I realize the epithet is unfortunately misleading.

The diagnostic character to which I attach the greatest importance is the dense woolly indumentum inside the lower part of the perianth lobes and on the anthers. This character is constant throughout the above cited specimens.

All collectors of *C. erecta* have failed to procure the rootstock. I found the plant to possess a subspherical tuber about 2 cm. in diameter and situated about 5 cm. below the ground level. The plant breaks off very easily above the tuber, as happens so readily in the case of our British *Conopodium.*

I would again emphasize the importance of collectors obtaining the underground parts of herbaceous plants, as they so often afford useful taxonomic characters and provide interesting information regarding the biology of the species.

E. Milne-Redhead.

Scrophulariaceae

Limnophila bangweolensis (*R. E. Fries*) *Verdcourt,* comb. nov.

Ambulia bangweolensis R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911–12, **1,** 288 (1916).

Since *Ambulia* Lam. is a *nomen rejiciendum* a new combination is required. Only one sheet of this plant is preserved at Kew, and this would appear to be the first gathering made since the plant was originally found in 1911 by R. E. Fries. This, the type specimen, has not been seen, but the Kew sheet agrees very well with the excellent description given by Fries and also with his figure. The Kew sheet (*Greenway* 6213) bears the following data : " a perennial aquatic herb with small white flowers, growing in water in a moorland drainage peat bog. Locally dominant with *Sphaeranthus* and a yellow flowered *Limnanthemum*. Aquatic leaves finely dissected. North of Abercorn, c. 5000 ft. altitude, 8/7/1941 ".

B. VERDCOURT.

LABIATAE

Englerastrum gracillimum *T. C. E. Fries* in Notizbl. Bot. Gart. Berl. **9**, 69, tt. 1b, 2a (1924).

Englerastrum diffusum Alston in Bull. Misc. Inform. Kew, **1926,** 298 (1926).

Plectranthus gracillimus (T. C. E. Fries) Hutch. et Dandy in Bull. Misc. Inform. Kew, **1926,** 481 (1926).

Plectranthus tenuis Hutch. et Dandy, l.c. 481 (1926) ; Hutch. et Dalz., Fl. W. Trop. Afr. **2,** 289 (1931).

Coleus diffusus (Alston) Robyns et Lebrun in Ann. Soc. Sci. Brux., sér. B, **49,** 106 (1929).

Coleus gracillimus (T. C. E. Fries) Robyns et Lebrun, l.c. 106 (1929).

SIERRA LEONE. Region of the source of the Niger, at Sorémodou [Seremodu, Deliduge Chiefdom], 28 Jan. 1909, *Chevalier* 20567.

NIGERIA. Nupe, 1858, *Barter* s.n. (type of *E. diffusum*). Ilorin District. Ilorin–Jebba road near R. Oshin Bridge, on stony ground amongst recently burnt scrub, 1 Dec. 1949, *Meikle* 675 :—erect annual up to 7 dm. high, very viscid, without leaves ; flowers bright blue. Plateau District. Mada Hills, Wana, in rock crevices, 600 m., May 1930, *Hepburn* 92 :—flowers blue. Muri Province, weed in arable land, 20 Nov. 1914, *P. H. Lamb* 72 :—flowers minute, blue.

BELGIAN CONGO. Mont Corva, 15 May 1895, *Descamps* s.n. (type of *E. gracillimum* in Berlin Herbarium) :—very pretty blue flowers.

NORTHERN RHODESIA. Mkushi District. 8 Km. NE. of Chiwefwe, 14 July 1930, *Hutchinson & Gillett* 3663 :—flowers sky-blue. Ndola District. Mufulira, in open forest, 29 May 1934, *Eyles* 8215 :—erect, no leaves ; panicle brittle, very viscid ; flowers glistening blue. 3 miles E. of Mufulira, in laterite area of *Brachystegia* woodland, 1200 m., 13 June 1948, *Cruse* 368 :—plants erect ; stems woody, brown ; leaves fallen ; pedicels very slender, sticky with black tarry substance ; flowers semi-transparent, blue.

This widely spread annual possesses an unusually large number of names. Until the genuine limits of the members of the *Ocimoideae* are more satisfactorily defined, I prefer to leave this plant where Fries placed it, in *Englerastrum*.

E. MILNE-REDHEAD.

Monechma ciliatum (*Jacq.*) *Milne-Redhead* in Bull. Misc. Inform. Kew, **1934**, 304 (1934).

Hygrophila lutea T. Anders. in Journ. Linn. Soc. **7**, 22 (1864), synon. nov. ; Burkill in Dyer, Fl. Trop. Afr. **5**, 32 (1899) ; Hutch. & Dalz., Fl. W. Trop. Afr. **2**, 247 (1931).

Examination of the type specimen of *Hygrophila lutea* T. Anders. (*Barter* 1163 from Onitsha) shows it to be a galled state of *Monechma ciliatum*. Barter states " flowers bright yellow ", but Anderson does not appear to have seen any corollas. He describes the calyx taken from a galled subglobose inflorescence and states " Corolla parva, lutea ". He does not give his reasons for placing the plant in *Hygrophila*. Burkill retained the species in *Hygrophila*, as no further evidence had in the meantime come to light to throw doubt on Anderson's view. In 1919 a specimen of *Acanthaceae* was received from Lely from Sokoto, Nigeria, showing both galled and normal inflorescences and this was named by Turrill as *Monechma hispidum* Hochst., the name by which *M. ciliatum* was known in the Flora of Tropical Africa. Its similarity to *H. lutea* was not then recognized, neither was it in 1931 when Hutchinson & Dalziel retained Barter's specimen under *Hygrophila*, whilst agreeing that Lely's specimen was *Monechma*. The above interpretation of *H. lutea* would account for that species not having been seen again since Barter got it. The creature which caused the gall remains unknown.

E. MILNE-REDHEAD.

VELLOZIACEAE

Vellozia schnitzleinia (*Hochst.*) *Bak.* var. **occidentalis** *Milne-Redhead*, var. nov. ; a *V. schnitzleinia* (Hochst.) Bak. var. *schnitzleinia* caudice valde evoluto facile distinguenda.

Frutex nanus. *Caudices* numerosi, usque 5 dm. longi, 1·5–2 cm. diametro, simplices (vel interdum bifurcati, teste Keay), basibus foliorum delapsorum imbricatis persistentibus dense tecti, brunnei. *Folia* circiter 12, ad apicem caudicis conferta, linearia, rigide coriacea, superne in apicem acutum sensim angustata, dorso plus minusve plicata, usque 32 cm. longa 6 mm. lata, glabra sed margine et nervo dorsali praesertim apicem versus minute et inconspicue aculeaolata, praesertim in pagina inferiore nervoso-striata, margine incrassata. *Pedunculi* foliis breviores sed sub fructum iis plus minusve aequilongi, in axillis foliorum solitarii, rigidi, inferne glabri, superne apicem versus dense patenter setosi. *Perianthii* tubus ovario adnatus, setis patentibus dense vestitus ; lobi glabri, lineari-lanceolati, apice acuti, 3 exteriores circiter 35 mm. longi et 8 mm. lati, 3 interiores circiter 30 mm. longi et 10 mm. lati. *Antherae* sessiles, basi perianthii loborum affixae, lineares, 17–20 mm. longae, stylum leviter excedentes. *Stylus* filiformis, inconspicue triqueter et trisulcatus, totus circiter 16 mm. longus, stigmatibus 3 circiter 10 mm. longis longitudinaliter vestitus. *Ovarium* circiter 6 mm. altum, 4 mm. diametro, obtuse obscureque triquetrum ; ovula in loculis numerosissima. *Fructus* subglobosus, obscure triqueter, circiter 17 mm. altus et 15 mm. diametro, perianthio marcido coronatus ; semina subcylindrica ; testa spadicea, dorso et apice in appendicem aliformem hyalinam plus minusve inflatam et spongiosam producta, circiter 3 mm. longa et 0·6 × 1 mm. diametro.

NIGERIA. Zaria Province. Zaria District. Anara Forest Reserve, Kan Gimi, on flat gneiss outcrop behind Rest House, with *Sarcostemma viminale* and *Bombax* sp., 7 May 1948, *Keay in Forest Herb., Ibadan* 22903 :—perennial herb forming thick mat on bare rock ; shoots erect up to 50 cm. (to base of fresh leaves) sometimes bifurcated but usually unbranched ; stems covered with brown remains of old leaves ; fresh leaves leathery, pale green ; each stem with 1–3 flowers, the pedicels lengthening after flowering so that the earliest flower (now in fruit) may be 10–12 cm. above the youngest ; pedicel and ovary pale green with white hairs ; the hairs on the unripe fruit are stiff and bristly ; perianth segments spreading white, closing together in the fruiting stage and becoming purple ; unripe anthers pale yellow ; pollen orange, stigma and style cream ; young fruits green. Same locality, in open savannah woodland with *Isoberlinia doka* and scattered *Gardenia* sp., 23 Sept. 1948, *J. Olorunfemi in For. Herb., Ibadan* 24356 :—herb of about 3 dm. high, growing on rocks ; stems rough ; flowers white ; ovary hairy.

Mr. R. W. J. Keay of the Nigeria Forest Service is to be congratulated on discovering a member of the *Velloziaceae* in Nigeria and on the excellently prepared and carefully annotated specimens of it which he has submitted to Kew. Hitherto the family *Velloziaceae* was unknown from the area covered by Hutchinson & Dalziel's Flora of West Tropical Africa, and, in fact, from the whole Sudan region except for an unnamed sterile specimen collected by the late Mr. J. G. Myers (no. 9518) on the summit of Mt. Iro in the Equatoria Province of the Anglo-Egyptian Sudan. In the dry region farther east, however, both in the Turkana district of Kenya and in southern Abyssinia around Arussi there is a species, *Vellozia schnitzleinia* (Hochst.) Bak., which seems to be frequent in its occurrence and which is undoubtedly very closely allied to the Nigerian plant. In fact the only firm character that I have been able to find in order to distinguish these plants is the presence of a well developed stem, some half a meter tall in the Nigerian plant, whilst *V. schnitzleinia* has a stem at most 8 cm. long, but usually less than half that length. In view of the importance which I place on characters of habit, and considering the apparent geographical isolation of the Nigerian plant, I am choosing to describe it as a distinct variety, *occidentalis*, of *V. schnitzleinia*.

The scarcity of the *Velloziaceae* in West Africa is very remarkable*, as the family is strongly represented in tropical South America, and the climate and physiography of large areas of West Africa would appear to afford eminently suitable habitats. Can it be that its Cyperaceous rivals, *Micradracodes* Hua and *Trilepis* Nees† have all but won in the battle for existence?

E. MILNE-REDHEAD.

ARACEAE.

Amorphophallus abyssinicus (*A. Rich.*) *N. E. Br.* in Dyer, Fl. Trop. Afr. **8,** 160 (1901), non Gombocz (1936).

Arum abyssinicum A. Rich., Tent. Fl. Abyss. **2,** 352 (1851).

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*Through the kindness of Prof. Dr. Emilio Guinea López, I have been able to examine the specimen from Spanish Guinea cited as Barbacenia Schnizleiniana (Bak.) Pax " on page 258 of his Ensayo Geobotánico de la Guinea Continental Española (1946). This specimen, which is sterile, is undoubtedly Cyperaceous and I would suggest it is a species of *Trilepis* Nees. This view is confirmed by my colleague, Dr. C. R. Metcalfe, who has kindly compared the leaf anatomy with that of *Trilepis*.

†See Gilly in Brittonia **5,** 9 (1943).

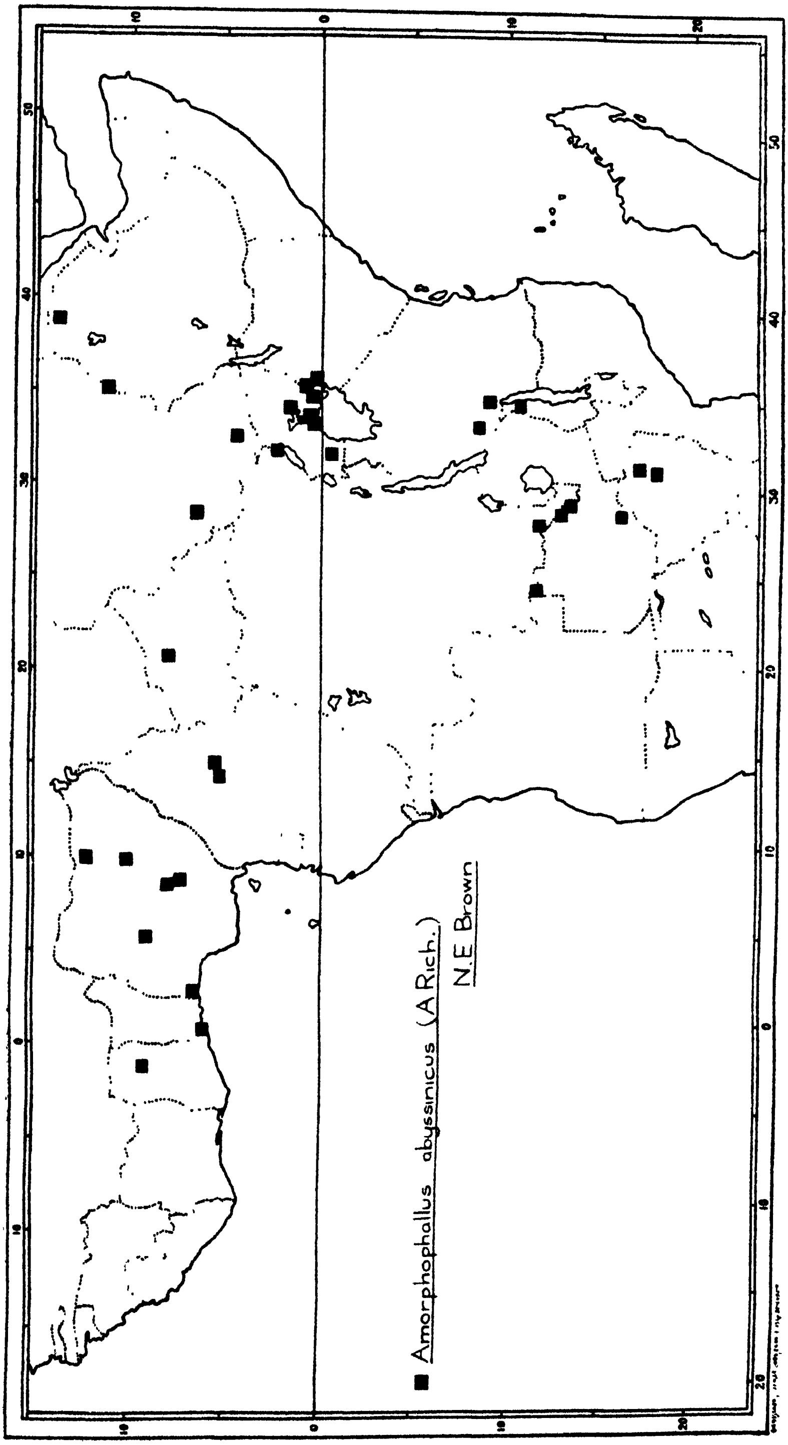

Fig. 9. Distribution of *Amorphophallus abyssinicus*.

Sauromatum abyssinicum (A. Rich.) Schott, Syn. Aroid. **1,** 25 (1856).

[*Hydrosme fontanesii* (Kunth) Schott, sec. Schott, Prodr. Syst. Aroid. 133 (1860), pro parte, quoad descr. infl. et spec. Barteri, non *Amorphophallus fontanesii* Kunth, Enum. Pl. **3,** 35 (1841)].

Hydrosme schweinfurthii Engl. in DC., Mon. Phan. **2,** 322 (1879).

Amorphophallus schweinfurthii (Engl.) N. E. Br. in Dyer, Fl. Trop. Afr. **8,** 149 (1901).

Amorphophallus barteri N. E. Br. in Dyer, Fl. Trop. Afr. **8,** 151 (1901).

[*Amorphophallus mossambicensis* (non Klotzsch ex Garcke).—N. E. Br. in Dyer, Fl. Trop. Afr. **8,** 150 (1901), pro parte, quoad spec. Scottii.].

Hydrosme warneckei Engl. in Engl., Bot. Jahrb. **36,** 238 (1905).

Hydrosme chevalieri Engl. in Bull. Soc. Bot. Fr. **54,** Mém. **8,** 24 (1907).

Amorphophallus warneckei (Engl.) Engl. et Gehrm. in Engl., Pflanzenr. IV, **23C,** 71 (1911).

Amorphophallus chevalieri (Engl.) Engl. et Gehrm. in Engl., Pflanzenr. IV, **23C,** 69 (1911).

The characters used both by N. E. Brown and by Engler for diagnostic purposes in *Amorphophallus* Blume sect. *Hydrosme* (Engl.) Engl. are, in my opinion, unsound. The relative lengths of the sterile portion of the spadix, both compared with the fertile portion of the spadix and with the spathe are extremely variable even in plants taken from a single locality. I place importance neither on the degree of lobing of the stigma, nor on the extent of the undulation of the spathe margin, and I find the shape of the ultimate divisions of the leaves to range from obovate acuminate to narrowly oblanceolate. Characters which I consider to be of specific diagnostic importance are the glabrous strongly ribbed inner surface of the convolute lower portion of the spathe, the strongly glaucous zone on the inner surface at the base of the spathe where it is constricted around the spadix, and the sessile stigma.

The species is widely distributed in the savannah regions of Africa, as is shown by the accompanying map (Fig. 9), and is, as indicated above, extremely variable. There would appear to be a tendency for plants with shorter and more slender appendices to the spadices to occur more frequently in the north-western area of distribution. Yet a specimen from Tamale in the Gold Coast has a large appendix and is indistinguishable in the dried state from specimens collected near Lake Rukwa in southern Tanganyika. One does not get a completely fair idea of the species by examining herbarium material, as there is a natural tendency for collectors to gather from a population the smaller inflorescences which offer less difficulty in the press.

I would like to convey my thanks to Prof. H. Humbert, Director of the Muséum Nationale d'Histoire Naturelle, Paris, for kindly sending on loan to Kew both the type specimen of *Arum abyssinicum* A. Rich. and five sheets of *Hydrosme chevalieri* Engl.* without seeing which I should have been unable to have arrived at the above conclusions. I would also like to thank Dr. H. Wild, of Salisbury, Southern Rhodesia, and Mr. R. W. J. Keay of Ibadan, Nigeria, for supplying me with specimens and information.

E. MILNE-REDHEAD.

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* Of the five sheets written up as *H. chevalieri* Engl., I have selected *Chevalier* 8399 as the lectotype of that specific name.

A NEW GENUS OF INDIAN GRASSES

N. L. BOR

Hubbardia *Bor* genus novum *Graminearum* : tribus *Isachnearum* :—

Spiculae paniculatae, oblongo-ellipticae, obtusae vel acutae, exaristatae, parvae, pedicellatae ; anthoecia duo, inter glumas inclusa ; inferius ad lemma redactum ; superius hermaphroditum ; rhachilla brevissima, supra glumas disarticulans, supra anthoecium superius haud producta. *Glumae* aequales, plus minus similes, spiculis aequilongae, membranaceae, 7-nerves, dorso convexae, 7-costatae, inter nervos dorso pilis brevibus e tuberculis ortis praeditae. *Anthoecium inferius* vacuum ; lemma oblongo-ellipticum, apice obtusum, laeve, glabrum, valide 7-nerve ; palea nulla. *Anthoecium superius* hermaphroditum ; lemma eo anthoecii inferioris simile, 7-nerve, laeve, glabrum ; palea nulla ; stamina 3 ; antherae parvae ; styli 2 ; stigmata plumosa ; lodiculae non visae ; caryopsis fusiformis, lemmate superiore inclusa ; hilum breve, lineare.

Gramina annua, saxis humidis incola ; culmi graciles vel gracillimi, reptantes, pauci-nodes plerumque multi-nodes, e nodis radicantes ; laminae tenuissimae ; ligulae nullae ; paniculae multi-vel pauci-spiculatae ex culmorum nodis omnibus emergentes, nonnunquam ad spiculam singulam nodis inferioribus redactae.

Species unica, India orientali incola.

Hubbardia heptaneuron *Bor* ; species nova :—Gramen annuum, saxis humidis incolum. *Culmi* plerumque prostrati, e nodis radicantes, demum apicibus erecti vel penduli, pauci- vel multi-nodes, striati, gracillimi, ramosi, innovationibus intravaginalibus, nodis glabri. *Foliorum laminae* ad 3 cm. longae, 6 mm. latae, ellipticae vel oblongo-ellipticae, apice acutae, basi rotundatae, tenuissimae, papyraceae, supra nervis longitudinalibus pilis brevibus distiche patulis tectae, infra nervis pilis longibus sparse tectae sed inter nervos pilis aureis brevissimis numerosis praeditae, pallide virides, fere translucentes, marginibus scabrae ; *vaginae* internodiis breviores, laxissimae, e culmis solutae, striatae, nervis minutissime pilosae, sed marginibus et dorso versus pilis longioribus praeditae ; *ligulae* nullae.

Paniculae numerosae, ex nodis omnibus emergentes, multi- vel pauci-spiculatae, nonnunquam ad spiculam singulam redactae ; rami capillares, laeves glabrique ; ramuli terminales spiculas longe pedicellatas gerentes. *Spiculae* 2–3 mm. longae, teretes ; *gluma inferior* spiculae aequilonga, oblongo-acuta, nonnunquam obtusa vel apice erosa, conspicue 7-nervis, dorso inter nervos pilis brevibus e tuberculis ortis scabra ; *gluma superior* similis, 7-nervis, dorso scabra, pilis brevibus nervis exterioribus apicem versus praedita. *Anthoecium inferius* vacuum ; *lemma* oblongo-obtusum, apice hyalinum, 7-nerve, glabrum, laeve, 2–2·5 mm. longum ; *palea* nulla. *Anthoecium superius* hermaphroditum ; *lemma* oblongo-obtusum, 7-nerve, apice hyalinum, 2·5 mm. longum. *Stamina* 3 ; *antherae* 0·33–0·5 mm. longae ; *styli* duo ; *stigmata* plumosa. *Caryopsis* 1·25 mm. longa, fusiformis ; hilum lineare, 0·3 mm. longum.

Ind. Or. : Bombay, N. Kanara, Jog, Gersoppa Falls, 130 m., Oct. 1919, *L. J. Sedgwick* 7089 " pendulous from a wet rock " (Typus in Herb. Kew.) ; Gersoppa Falls, Oct. 1919, Hallberg et McCann s.n., " on rocks ".

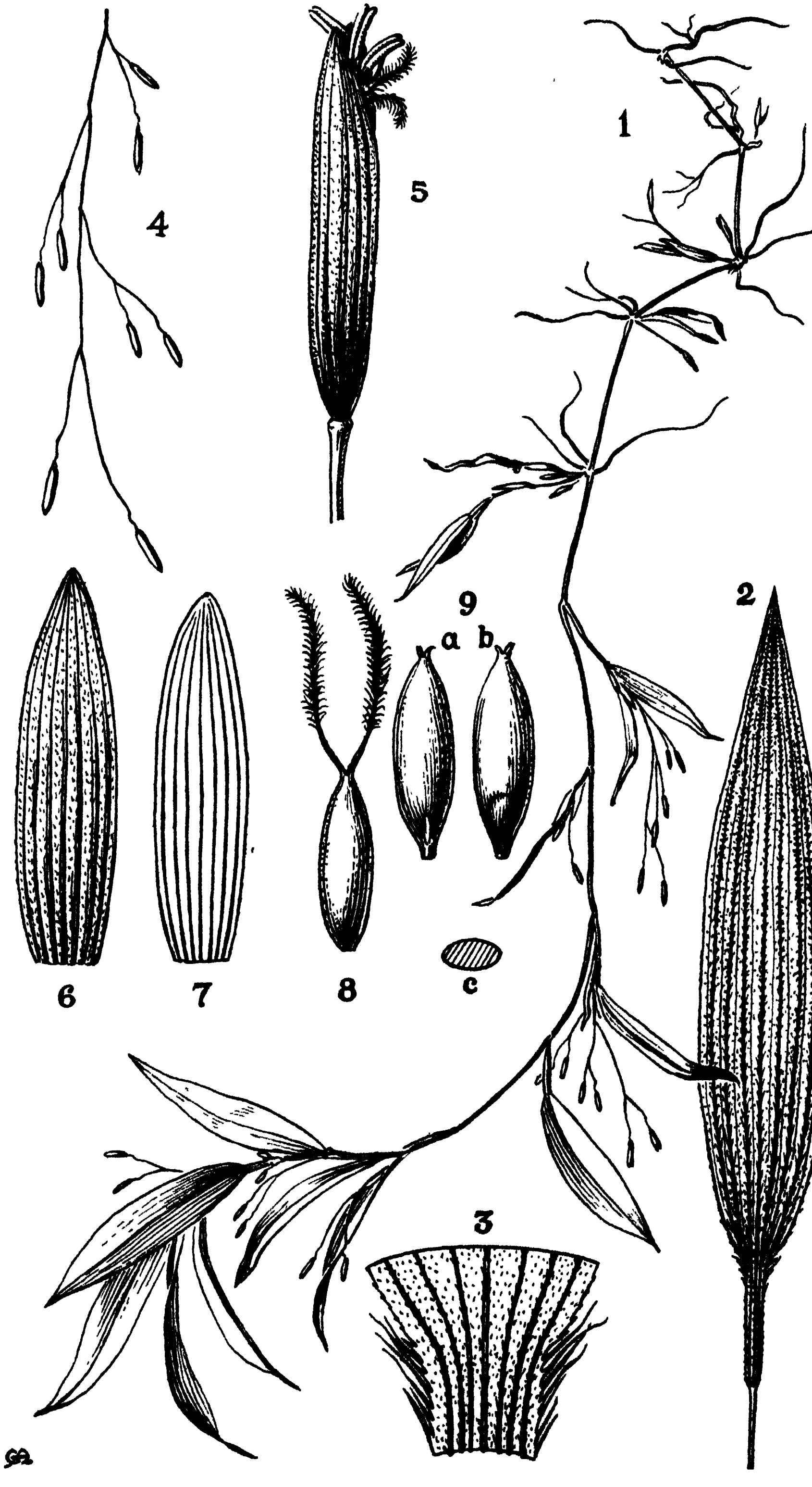
a
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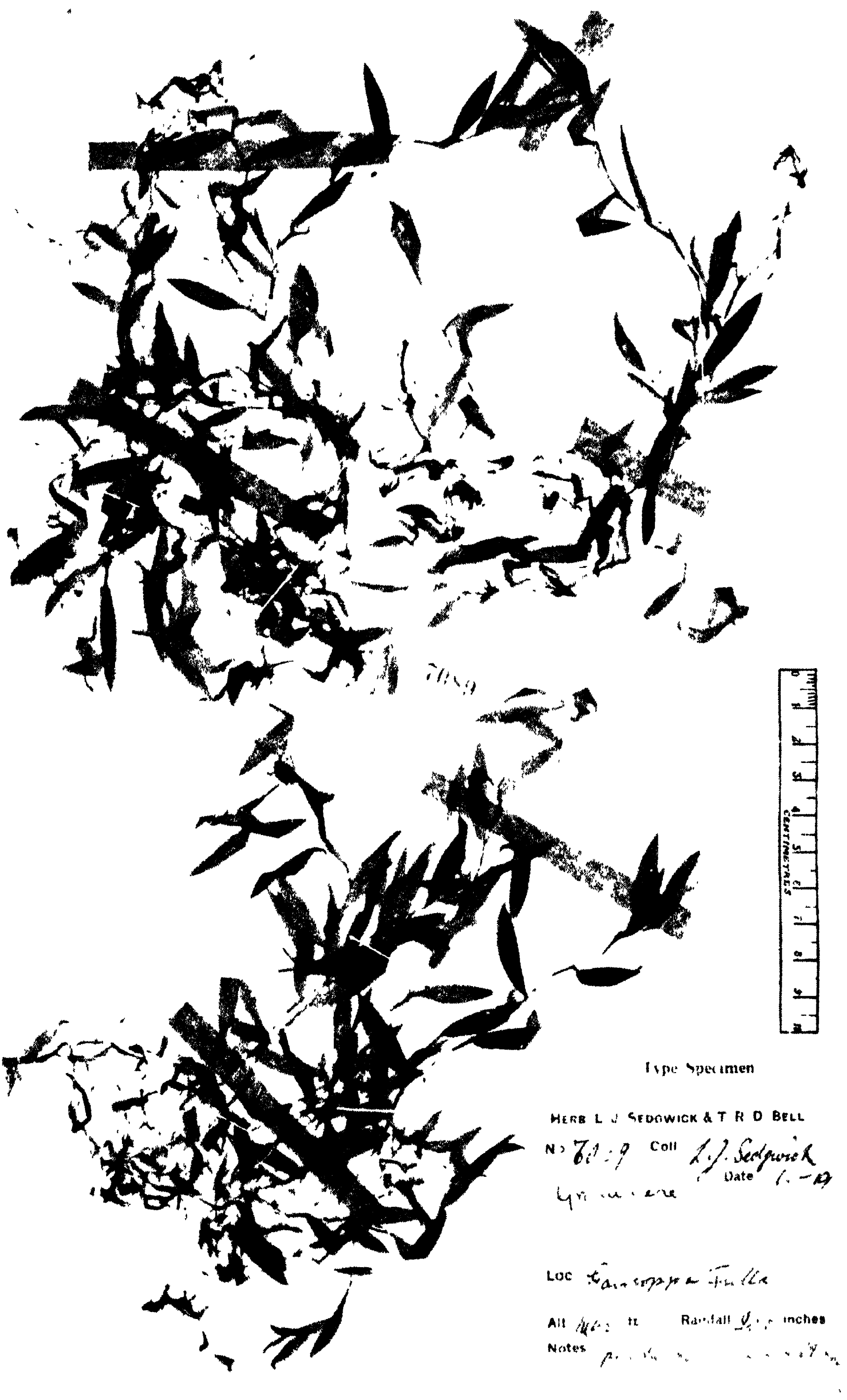
PLATE 1



Hubbardia heptaneuron Bor.
Photograph of the isotype, preserved in the Blatter Herbarium, St. Xavier's College, Bombay.

This extremely delicate and graceful grass has only been collected in one place, namely, in the gorge where the Sharavati River tumbles over the high cliff at Jog in Western India on the boundary between the Bombay Presidency and Mysore State. It is described as growing on and pendulous from the wet rocks, doubtless kept moist by the dense mist cast up by this most impressive cataract, known as the Gersoppa Falls, where the water falls in four cascades over 300 m. in all, into the deep pool at the foot of the cliff.

The Sharavati River, which is not very long, is much swollen during the rainy months of the monsoon (June to October), but contracts rapidly at the onset of the dry cold weather, and in the hot dry months of the spring and early summer, which precede the monsoon, is a mere trickle of clear water. For most of the year, then, the rocks in close proximity to the waterfall are dry, and during a part of the year at least, exposed to direct insolation and tropical temperatures. Vegetation therefore which can exist in such a habitat must be quite exceptional.

While little is known about the conditions which *Hubbardia* has to tolerate, it can with safety be assumed that as an annual it passes the whole of its life between the beginning and the end of the monsoon. The extremely delicate texture of the leaves, for example, indicates that they could only exist in an atmosphere which is supersaturated, as the air in the neighbourhood of the falls certainly is. The clouds of mist and driving spray obviate the necessity for any special protective devices on the leaves to prevent excessive transpiration. In fact the leaf of *Hubbardia* is so thin as to suggest that gaseous exchange takes place directly with the outside world, from the upper and lower surfaces.

The systematic position of the grass presented some difficulties since nothing like the structure of the spikelet is to be found in any known genus of grasses. The structure, which in short, consists of two seven-nerved glumes enclosing two 7-nerved scales, the upper of which contains a hermaphrodite flower, is quite unique.

An investigation into those anatomical characters which are of use in the classification of the Graminae, revealed the following:—

1. The starch grains are compound.
2. The chlorenchyma of the leaves is evenly distributed in the tissue between the vascular bundles.
3. The hairs on the leaves are unicellular.
4. The silica cells are few in number and their outline, as seen from above, is more or less square with the four sides sometimes slightly concave.

With this data, combined with what we know of the structure of the spikelets—2-flowered, with awnless lemmas and articulation above the glumes—some progress can be made.

Actually it is quite clear that the grass cannot be placed in the *Panicoideae* (*Paniceae*, *Andropogoneae*, *Maydeae*) because of the festucoid type of

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Hubbardia heptaneuron Bor.

1 : habit. 2 : leaf and sheath. 3 : collar. 4 : raceme. 5 : spikelet. 6 : glume. 7 : lemma. 8 : ovary. 9 : caryopsis, (a) adaxial view, (b) abaxial view, (3) transverse section.

chlorophyll tissue in the leaves and the absence of 2-celled hairs on the epidermis. While the festucoid type of leaf anatomy is more or less typical of grasses which grow in temperate regions, it is also found in tropical grasses which live in habitats which are aquatic. Two such tribes are the *Oryzeae* and *Isachneae*.

It may be noted that the tribe *Isachneae* possess characteristics which enable *Hubbardia* to fit in without any undue straining. The anatomical characters of the tribe agree with those of *Hubbardia*, 7-nerved glumes are not unknown in *Isachne* (a 7-nerved lower glume is found in *Limnopoa*) the upper lemma is similar to the lower in a number of species, and finally a comparison of the silica cells of *Hubbardia* with those of one species of *Isachne* shows general agreement in outline.

The latest conception of the tribe *Isachneae* Benth. is that drawn up by C. E. Hubbard in Hooker's Icones Plantarum sub. tab. 3422. Before *Hubbardia* can be fitted into this tribe, the characters would have to be widened to accommodate genera in which the lower floret was neuter as well as male, and also provision would have to be made for the absence of paleae and lodicules. Widened by the inclusion of these minor details, the tribe *Isachneae* will accommodate the genus *Hubbardia* without any trouble.

This grass was first discovered when the Rev. Father H. Santapau, Rector of St. Xavier's College, Bombay, placed the grass collections of the late L. J. Sedgwick at the writer's disposal in 1950. There were two sheets of Sedgwick's no. 7089 in these collections, one of which has been made the type sheet and is at Kew, the isotype is in the Blatter Herbarium at Bombay. Two further gatherings of the same species came to light when Father Santapau sent some unnamed grasses from the Blatter Herbarium to Kew. These had been collected by Hallberg and McCann at the same place, Jóg, Gersoppa Falls, in the same month and year as Sedgwick's collection. Fragments of these gatherings are also at Kew. We are grateful to Father Santapau for generously donating this material to the Herbarium of the Royal Gardens, Kew.

The generic name has been chosen in honour of my colleague, C. E. Hubbard, whose work on the *Gramineae* is so well known.

Field Marshal J. C. Smuts and Kew

Smuts' leading position as a statesman obscured the deep interest he took in natural vegetation and whilst in and out of office he supported and encouraged botanical research in all its branches including the establishment of the Botanical Survey of S. Africa and a National Herbarium. Whenever he could he paid a visit to Kew and became acquainted with those who had contributed to the later parts of the *Flora Capensis*. He led an expedition in which Dr. Hutchinson took part through Rhodesia and Lake Tanganyika which resulted in the addition of valuable material to the Kew collections. An account of the vegetation of Schoemanskloof in the Eastern Transvaal, by Smuts, appeared in the *Kew Bulletin* in 1933, and he presented to Kew a set of the specimens then collected. In the passing of the Field Marshall both African botany and Kew have lost a very great friend.

TROPICAL AFRICAN PLANTS : XXII*

RANUNCULACEAE.

Anemone thomsonii *Oliv.* This species was first described by D. Oliver in Journ. Linn. Soc. Bot. **21,** 397 (1885) from material collected on Kilimanjaro by *J. Thomson.* The type is in the Kew Herbarium. The species has since been collected from other mountains in southern Sudan, Uganda, Kenya, and Tanganyika. It is obviously variable in the depth and degree of cutting of the segments of the ternately segmented leaves. Ulbrich described a variety from the Aberdare Mountains and all specimens from this range that we have seen appear to belong to the same variety. Material, of several collectors, from Mt. Hanang in Tanganyika, has all very narrow ultimate segments giving the plant a notable appearance. This variation seems worthy of a varietal name. The remaining material we have not been able to sort out into such clear-cut varieties but acknowledge that it still shows a considerable range of variation. We suggest the following classification on the basis of available evidence.

A. thomsonii *Oliv.*

var. **thomsonii** foliorum segmentis cuneatim late ellipticis vel oblatis plus minusve valde lobatis vel segmentatis, lobis ultimis 1·5–5 mm. latis.

TANGANYIKA. Kilimanjaro, *J. Thomson* (in Herb. Kew.).

var. **friesiorum** *Ulbrich* foliorum segmentis cuneatim oblique ovato-ellipticis vel oblongo-ellipticis plus minusve valde lobatis, lobis ultimis (haud dentibus) 4–8 mm. latis.

KENYA. Aberdare, prope Sattima, ca. 3000 m. in campo, *R. E. et T. C. E. Fries* 2366. (In Herb. Uppsala, not seen).

var. **angustisecta** *Milne-Redhead et Turrill*, var. nov., foliorum segmentis valde dissectis ultimis linearibus 0·5–0·75 mm. latis.

TANGANYIKA. Mt. Hanang, 3360 m., 8.2.46, *P. J. Greenway* 7639 (holotype in Herb. Kew.).

Ranunculus keniensis *Milne-Redhead et Turrill*, sp. nov., a *R. aberdarica* Ulbr. sepalis reflexis praecipue distinguitur.

Herba perennis, caulibus plus minusve erectis usque ad 2·4 dm. longis saepissime 3-4-floris teretibus in parte inferiore pilis longis distinctis patulis instructis in parte superiore parce pilosis vel glabris. *Folia basalia* trifoliolata ; petiolus 9–14 cm. longus, patule pilosus; petiolulus terminalis, 0·4–3·5 cm. longus; petioluli laterales fere nulli, usque ad 2·5 cm. longi ; foliola late ovata vel oblata, plus minusve trilobata, grosse dentata, terminalia 2–2·5 cm. longa, 2·6–2·9 cm. lata, lateralia leviter minora, omnia utrinque adpresse pilosa, margine ciliata. *Flores* pauci, minores *Sepala* reflexa, elongato-ovata, subobtusa, 4 mm. longa, in pagina abaxiale sparse pilosa, in pagina adaxiale glabra. *Petala* elongato-obovata, apice rotundata, usque ad 7 mm. longa, flava. *Stamina* parva, circiter 12–15. *Carpella* 15–20, ovata, 2 mm. longa, glabra, in stylum breviter vix hamosum contracta. *Achenia* pauca (? an semper), ovata, fere recta, vix hamosa, 4·5 mm. longa, glabra, haud tuberculata vel foveolata.

KENYA. Mt. Kenya, north-west face at base of Caesar's Seat, 3660m., *C. Gilbert Rogers* 615 (holotype in Herb. Kew.).

E. MILNE-REDHEAD AND W. B. TURRILL.

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*Continued from K.B. **1950,** 384 (1951).

Flora of the Cape Peninsula*—This book is the result of the joint labours of a number of botanists extending over a period of some fifteen years, and is the first comprehensive Flora of the Cape Peninsula to deal with the plants of this area under a separate cover. Previously, descriptions of the plants of the Peninsula were only to be found in the *Flora Capensis* and scattered through periodicals and other recent publications.

The work now published brings the descriptions of the plants of this region up to date. It includes 2622 species and 702 genera. The dicotyledons number 1713 in 459 genera, the monocotyledons 846 in 209 genera, the gymnosperms 6 in 3 genera and the pteridophytes 57 in 28 genera. The editors compare the numbers with those given in other works. For instance J. M. Black's *Flora of South Australia* includes 2468 species. The *London Catalogue of British Plants* (ed. 10) enumerates 2047 while Coste in his *Flore de France* gives 4354 species for France and Corsica together. When comparing these figures it should be borne in mind that the area of the Peninsula is approximately one sixth greater than that of the Isle of Wight.

A useful feature of the work is the provision of keys to the families, the genera and the species. It should, however, be noted that the keys have been prepared to assist only in the identification of the plants of the Cape Peninsula and are not to be regarded as applicable in a general way.

The descriptions are written in non-technical style and are original in that they are not taken from the works of earlier authors but are based on living material wherever this has been available. It seems a pity that references to the places of publication of species are not supplied. Synonyms are not given except where names differ from those used in the *Flora Capensis*.

The nomenclature is in accordance with the International Rules of Botanical Nomenclature as laid down at the International Botanical Congresses of 1930 and 1935. The Flora is arranged according to Engler's system as given in his *Syllabus der Pflanzenfamilien* and Engler and Prantl's *Die natürlichen Pflanzenfamilien*.

The work is provided with a glossary, and indexes to the popular and scientific names, and will be welcomed by all students of the flora of the Cape Peninsula. H. S. MARSHALL.

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*Flora of the Cape Peninsula. Edited by R. S. Adamson and T. M. Salter. Pp. xix + 889, map. Cape Town and Johannesburg : Juta and Co. Limited. 1950. Price 55/-.

Orchids and how to grow them*—This book is primarily intended for those amateurs who want to know and grow orchids. After opening with interesting chapters on the "Life Secrets of the Orchid" and "The Orchid Family" the author goes on to deal with the culture of these interesting plants and considers the questions of housing, potting, pests and diseases, growing orchids from seed, artificial feeding and gravel culture. There is also a chapter on hybrids followed by a list of orchid genera and species. It is unfortunate, however, that the accuracy of this list is marred by several spelling errors. The book contains a number of photographic illustrations, a coloured plate of *Laeliocattleya Bergenfield* and is provided with a useful index. The price, however, seems rather excessive. H. S. MARSHALL.

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*Orchids and how to grow them. By Adelaide C. Willoughby. Pp. xii + 135, illus. New York and London : Geoffrey Cumberlege, Oxford University Press. 1950. Price 21/-.

THE ARACEAE OF TRINIDAD AND TOBAGO, B.W.I.[*]

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I. *Introduction.*

The list that follows is based upon field studies in Trinidad and upon herbarium work at Trinidad and Kew. I am indebted to the Director of the Royal Botanic Gardens, Kew, for permission to work in the Herbarium ; and to Mr. N. Y. Sandwith for much assistance.

All the sheets that have been seen are cited here, the herbarium in which they are deposited being indicated by the appropriate initial, T or K.

II. *Keys.*

Key to Genera.

1.	Flowers hermaphrodite	2
	Flowers unisexual, female at base of spathe, male above	6
2.	Perianth present, terrestrial or epiphytic, rarely climbers	3
	Perianth absent, climbers	5
3.	Spathe flat, persistent, leaves entire	4
	Spathe embracing the spadix, leaves pinnatifid	*Dracontium*
4.	Spathe lanceolate, white, 3 or more cm. broad	*Spathiphyllum*
	Spathe linear, green, purple or crimson, less than 3 cm. broad	*Anthurium*
5.	Ovules 1–2 per ovary	*Monstera*
	Ovules numerous	*Anepsias*
6.	Plants terrestrial (or epiphytic) or climbing	7
	Plants aquatic, floating	*Pistia*
7.	Spadix with hairs between female and male flowers and with a flattened terminal appendage	*Typhonium*
	Spadix not as above	8
8.	Root climbers with elongate stems	9
	Terrestrial plants, rarely epiphytic, if climbing, then with short, thick internodes	10
9.	Leaves trisect	*Syngonium*
	Leaves not trisect	*Philodendron*
10.	Leaves peltate	*Caladium*
	Leaves not peltate	11
11.	Marsh plants with tall, woody, often spiny stems	*Montrichardia*
	Not as above	12

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[*] See also " Notes on the biology of the *Araceae* of Trinidad," by N. W. Simmonds, in Journ. Ecol. 38, 277-291 (1950).

12.	Leaves lanceolate, usually yellow-flecked	*Dieffenbachia*
	Leaves neither lanceolate nor yellow-flecked	13
13.	Leaves entire, cordate or sagittate	14
	Leaves divided to 1/4 way or more	15
14.	Resinous herb with cordate leaves	*Philodendron* (*giganteum*)
	Evil-smelling laticiferous herb with sagittate leaves	*Xanthosoma* (*jacquinii*)
15.	Stems tuberous, subterranean, leaves palmatisect	*Xanthosoma* (*helleborifolium*)
	Stems stout, aerial not tuberous, leaves trifid, the lobes pinnatipartite	*Philodendron* (*fendleri*)

Keys to Species.

Anthurium.

1.	Leaves lanceolate, oblanceolate or linear-lanceolate	2
	Leaves cordate	*A. guildingii*
	Leaves palmatisect	*A. pentaphyllum*
2.	Internodes long, a creeping epiphyte	*A. scandens*
	Internodes short, rosette epiphytes	3
3.	Leaf blades up to 30 cm. in length, tapering into the petiole at base	4
	Leaf blades commonly 60–100 cm. in length, variably rounded at base	6
4.	Spadix up to 4 cm. in length in flower or fruit	5
	Spadix 7 cm. or more in length	*A. willdenowii*
5.	Leaves 5–6 times as long as broad	*A. scolopendrinum*
	Leaves 10–20 times as long as broad	*A. gracile*
6.	Berries obovoid, white at base, purple at apex	*A. huegelii*
	Berries ellipsoid, white	*A. acaule*
	Berries ellipsoid, scarlet	*A. crassinervium*

Monstera.

1.	Plant slender, leaves entire, less than 15 cm. long	*M. obliqua*
	Plant robust, leaves commonly fenestrate and more than 20 cm. long	2
2.	Wings of petiole spreading, ca. 5 mm. broad, fruit lacking irritant cells	*M. pertusa*
	Wings of petiole erect, ca. 2–3 mm. broad, fruit with abundant irritant cells apically	*M. irritans*

Dieffenbachia.

1.	Leaves dark green above, pale green beneath	*D. seguine*
	Leaves flecked above, glaucescent green beneath	*D. picta*

Philodendron.

1.	Leaves entire, sometimes cordate	2
	Leaves trilobed, the lobes pinnatipartite	*P. fendleri*
2.	Leaves ovate or lanceolate, petiole winged	3
	Leaves variously cordate or rounded at the base, petiole not winged	4
3.	Leaves oblanceolate	*P. rudgeanum*
	Leaves ovate or ovate-lanceolate	*P. karstenianum*
4.	Petioles flat above, convex beneath	*P. accrescens*
	Petioles terete or subterete	5
5.	Petioles roughly warty	*P. rubens*
	Petioles smooth	6
6.	Stems short, massive, unbranched, hardly climbing, clothed in the fibrous remains of petioles and prophylls	*P. giganteum*
	Branched climbers with naked stems	7
7.	Leaves oblong, rounded at base, hardly cordate	*P. krugii*
	Leaves ovate- or broadly cordate with a deep, often overlapping sinus	8
8.	Leaves nearly as broad as long, basal lobes smoothly rounded in outline	*P. scandens*
	Leaves about 1/2 as broad as long, basal lobes somewhat angular in outline	*P. latifolium*

Xanthosoma.

1.	Leaves cordate-sagittate, angular at corners of basal lobes	*X. jacquinii*
	Leaves palmatisect	*X. helleborifolium*

III. *List.*

2. **Spathiphyllum cannifolium** (*Dryand.*) *Schott,* Gen. Aroid. **1** (1858) t.1.

Engler in Engl. Pflzr. 4, 23 B (1905) 57.

Lockhart (K) ; Fendler 747 (K) ; Crueger, Herb. Trin. 2248 (T) ; Finlay, Herb. Trin. 1996, La Brea, 25.2.1866 (T) ; Dannouse, Maraval, 4.5.02 (T) ; Riley 216, Four Roads, 30.5.24 (K) ; Broadway 7082, Caura, 11.1.29 (K) ; Broadway, Quare River, 25.3.34 (K) ; Simmonds, Herb. Trin. 13872, Tairico Bay, 8.12.46 (T, K) ; Simmonds, Herb. Trin. 14063, El Tucuche-Naranja, 2.1.48 (T).

Trinidad.

General, in damp places and by lowland streams. *Herb. Trin.* 14063 came from montane forest at 2300′, however.

Northern tropical South America, St. Vincent (Herb. Forsyth (K)).

Very variable in size and vigour.

2. **Anthurium scandens** (*Aubl.*) *Engl.* in Mart. Fl. Bras. **3,** 2 (1878), 78.

Engler in Engl. Pflzr. 4, 23 B, (1905), 57.

Dannouse, Arima, 2.5.1899 (T) ; Broadway 3951, Maraval, 12.1.11 (K) ; Broadway, Herb. Trin. 9925, Heights of Aripo, 10–26.1.22 (T) ; Broadway 6226, Oropuche local road, 7.5.26 (K) ; Broadway 6283, Las Lapas road, 5.2.26 (K) ; Simmonds, Herb. Trin. 14122, Brazil to Talparo, 25.1.48 (T, K) ; Simmonds, Herb. Trin. 14170, 9th mile of Cumaca road, 1.2.48 (T, K) ; Simmonds, Herb. Trin. 14231, Oropuche local road, 27.12.48 (T) ; Ayliffe, Herb. Trin. 14266, Arima–Blanchisseuse rd., 1948 (T).

Trinidad.

A creeping epiphyte recorded only in the north and centre of Trinidad, light-demanding and characteristic of cultivated trees such as cacao.

Tropical South and Central America and Greater Antilles.

Engler (*loc. cit.*) distinguishes six varieties of which *Broadway* 6226 seems to represent var. *leucocarpum* (Schott) Engl.

3. **Anthurium scolopendrinum** (*Ham.*) *Kunth,* Enum. Pl. **3** (1841), 68.

Engler in Engl. Pflzr. 4, 23 B (1905), 89.

A. gracile (Rudge) Lindl. Bot. Reg. 19, t. 1635 (1833), *quoad tab.*

Fendler 748 (K) ; Ryan (in Herb. Vahl., *ex* Engler) ; Broadway 4174, Maraval, 13.2.11 (K) ; Broadway 9374, Quare river, 1.2.34 (K) ; Simmonds, Herb. Trin. 13887, St. Augustine, 7.10.47 (T).

Trinidad.

Recorded only from northern districts.

Tropical northern South and Central America (the typical plant).

Very near to (and doubtfully distinct from ?) *A. gracile* from which it differs in the lanceolate leaves, down to 5 times as long as broad, to 5 cm. in width, the lateral veins making an angle of about 60° with the midvein.

4. **Anthurium gracile** (*Rudge*) *Lindl.* Bot. Reg. **19,** t. 1635 (1833), *quoad nomen* ; Engler in Engl. Bot. Jb., 25 (1898), 370 ; Engler in Engl. Pflzr. 4, 23 B (1905), 89.

Fendler 748 B (K) ; Crueger, Herb. Trin. 2243, 19.4.1847 (T) ; Broadway, Herb. Trin. 3790, Royal Botanic Gardens, 8.5.1889 (T) ; Britton, Freeman and Nowell 2577, Tabaquite, 26–8.3.21 (K) ; Hombersley 725–25 (K) ; Simmonds, Herb. Trin. 13886, Heights of Aripo, 9.2.47 (T, K).

Trinidad.

Recorded only from northern and central districts.

Tropical northern South and Central America.

Differs from *A. scolopendrinum* in the leaves linear-lanceolate, 10–20 times as long as broad, the lateral veins making an angle of about 45° with the mid-vein.

Hombersley 725–25 appears to be a dwarf form of this species.

5. **Anthurium willdenovii** *Kunth sensu* Schott ; Kunth, Enum. Pl. **3** (1841), 71 ; Schott, Prodr. (1860), 479 ; Engler in Engl. Pflzr. 4, 23 B (1905), 150.

Broadway 4496, Caledonia Lot 42, Tobago, on trees, 21.4.13 (K).

Tobago.

St. Lucia and Tobago.

Kunth based the species on a Willdenow plant which I have not seen. Schott took up the name and cited Forsyth, St. Lucia, which collection in Herb. Kew. (labelled " St. Lucia, Anderson, Herb. Forsyth purchased 1835 ") matches the Broadway sheet quite well. However, Engler gives south Brazil for distribution and his cited sheets in Herb. Kew. (*Glaziou* 9026, 17335 etc.) do not match the Broadway collection. Probably two species are involved.

6. **Anthurium huegelii** *Schott*, Prodr. (1860), 469.

A. trinitatis Engler in Engl. Pflzr. 4, 23 B (1905), 73.

Engler in Engl. Pflzr. 4, 23 B (1905), 71, *sub A. hookeri* Kunth.

Fendler 733 (K) ; Fendler 741 (K) (type of *A. trinitatis* Engl.) ; Hart, Herb. Trin. 5542, " Hort. Trin. and common ", July 1894 (T) ; Broadway, Herb. Trin. 7621, Moruga, 9.2.16 (T) ; Williams, *sine num.*. Monos, Oct. 1917 (T) ; Britton and Britton 2101, Valencia, 4.3.21 (K) ; Simmonds, Herb. Trin. 13882, Piedra blanca, 12.1.47 (T, K) ; Simmonds, Herb. Trin. 13883, Gasparee, 7.4.47 (T) ; Simmonds, Herb. Trin. 13884, Gasparee, 2.7.47 (T, K).

Trinidad.

General, epiphytic on trees in the moister districts, saxicolous in the drier.

West Indies, Trinidad to Dominica.

I follow Brown (Gard. Chron. **48** (1910) 153) in separating this species from *Anthurium hookeri* Kunth from British Guiana which has a rather characteristic short, relatively broad and blunt spadix. *A. trinitatis* Engl. differs from this species only in inconstant details of nervation. This is the common Trinidad species, but either of the two following might possibly be represented by some of the sheets cited above, so great are the difficulties of herbarium identification in this group.

7. **Anthurium acaule** (*Jacq.*) *Schott*, Melet., **1** (1832), 22.

Engler in Engl. Pflzr. 4, 23 B (1905), 69.

Putney Hill, Great Dog River, Tobago, Eggers (*ex* Engler), the only record.

Tobago.

West Indies, Puerto Rico to Tobago.

An ill-understood species nearly related to the preceding. According to Engler it may be distinguished by the prominence of the lateral nerves of 2nd and 3rd orders and this seems to be true of sheets in Herb. Kew. cited by him. Brown (Gard. Chron. **48** (1910) 153), however, ignores this point and states that the berries of *A. huegelii* are globose, white below, and purple at the apex while those of *A. acaule* are pear-shaped and white. Schott (Prodr. Aroid. (1860), 476) states that the berries are red and this statement was taken up but finally dropped by Engler. These difficulties can probably be resolved only by intensive field collection and monographic treatment.

8. **Anthurium crassinervium** (*Jacq.*) *Schott*, Melet., **1** (1832), 22.

Engler in Engl. Pflzr. 4, 23 B (1905), 76.

King's Bay, Tobago, Seitz 97 (*ex* Engler), the only record.

Tobago.

Tobago, Venezuela, Colombia, Panama.

Differs from the two preceding species, apparently, in the prominent primary lateral veins, the ovoid red berries and (according to Engler) the tepals which are broader than long. Schott's figures (Icon., 1857, t. 12–14) are magnificent ; a very similar plant of unknown provenance which grows in the Aroid House at Kew is doubtless this species.

9. **Anthurium guildingii** *Schott* in Oest. Bot. Wochenbl. (1857), 301.

Anthurium aripoense N. E. Brown in Bull. Torr. Bot. Cl., 51 (1924), 4.

Engler in Engl. Pflzr. 4, 23 B (1905), 178.

Broadway, Herb. Trin. 5230, Tucuche, 27.2.1893 (T) ; Herb. Trin. 6848, Botanic Gardens, 1906 (T) ; Broadway 7130, Heights of Aripo, 9.3.29 (K) ; Broadway, Herb. Trin. 9924, Heights of Aripo, near summit of mountain,' 10–26.1.22 (type of *A. aripoense* N. E. Br.) (T, K) ; Simmonds, Herb. Trin. 13889, Piedra blanca, 12.1.47 (T, K) ; Simmonds, Herb. Trin, 13888, El Tucuche, summit, 5.6.47 (T, K).

Trinidad.

Terrestrial and climbing in the forested heights of the northern mountain range only.

West Indies, Dominica to Trinidad.

An extremely variable species, and the specimens cited differ considerably in shape and size of the sinus and basal lobes, development of a constriction above the basal lobes, texture, thickness and colour of the leaves and size of the inflorescence. *A. aripoense* is merely one of the many forms. The species normally grows on the ground or climbs a little in deep shade in montane forest at 2500′ or more in the Northern Range ; the thick, pale leaf of Herb. Trin. 13888 from El Tucuche probably results from growth in an exposed habitat on the open, cleared top of this mountain.

10. **Anthurium pentaphyllum** (*Aubl.*) *G. Don* in Sweet, Hort. Brit., ed. 3 (1834), 633.

Engler in Engl. Pflzr. 4, 23 B (1905), 290.

Finlay, Herb. Trin. 2897, Irois, 24.4.1868 (T) ; Fendler 743 (K) ;

Tobago, G. L. Meyer 16, Bannock Burn, Delaford Woods, 28.7.1879 (K) ; Dannouse, Herb. Trin. 6751, Maracas Bay (T, K) ; Broadway, Herb. Trin. 7805, Mount Tamana, 16.2.15 (T) ; Freeman, Herb. Trin. 9066, Tamana, 18.4.20 (T) ; Britton, Britton and Hazen 1941, Mt. Tamana, 18.4.20 (K) ; Freeman and Williams, Herb. Trin. 11411, Point opposite Melville Islands, Tobago, 25.10.25 (T) ; Broadway, *sine num.*, Tamana, 27.3.25 (K) ; Simmonds, Herb. Trin. 13885, Gasparillo-Maracas trail, 13.4.47 (T) ; Simmonds, Herb. Trin. 13871, Mt. Aripo, 4.5.47 (juvenile) (T) ; Simmonds, Herb. Trin. 14062, Aripo, 24.12.47 (T) ; Simmonds, Herb. Trin. 14197, Cap de Ville, 29.2.48 (T) ; Simmonds, Herb. Trin. 14219, Naranja-Piedra blanca, 18.4.48 (juvenile) (T) ; Simmonds, Herb. Trin. 14384, Guaico-Valencia Reserve, 8.6.49 (T).

Trinidad and Tobago.

General, climbing in forest (an unusual habit in *Anthurium*).

Tropical South America.

The juvenile leaves are sagittate, not palmati-compound. It is a curious fact that this species which, though widely distributed in the island, is not common, is one of the best-collected of all the Trinidadian aroids.

Engler, l.c. 290, records *A. digitatum* (Jacq.) D. Don from Tobago, citing *Eggers* 5509 and 5776, from the Great Dog River valley. I have not seen specimens of these numbers, but suspect that the material should be referred to *A. pentaphyllum*.

11. **Anepsias moritzianus** *Schott*, Gen. Aroid. (1858), 73.

Engler and Krause in Engl. Pflzr. 4, 23 B (1908), 96.

Standley in Woodson and Schery, Fl. Panama, 2, 3 (1943), 46.

Simmonds, Herb. Trin. 13881, coll. between Piedra blanca and Naranja, 23.2.47 and 13.7.47 (T) ; Simmonds, Herb. Trin. 14352, Piedra blanca, 12.5.49 (sterile) (T, K).

Trinidad.

An extremely rare species, known only from one tree in forest at c. 1900′ in the Northern Range.

Venezuela, Panama and Costa Rica.

I have seen no authentic specimens. One Trinidad collection is in fruit in which it was impossible to verify the critical generic character concerned with septation. However, the present specimen matches Schott's description and figures (Gen. Aroid. (1858) t. 73) well and is doubtless correctly determined. A handsome, high-climbing species, the sharply broadened leaf base, slender channelled petiole and dark greyish-green metallic sheen on the leaves are very characteristic.

12. **Monstera pertusa** (*L.*) *de Vriese*, Hort. Sparm. Bergens (1839), 40.

Engler and Krause in Engl. Pflzr. 4, 23 B (1908), 103.

Fendler 735 (K) ; Eggers 5608, Tobago (*ex* Engler, *loc. cit.* as var. *jacquinii* (Schott) Engl.) ; Broadway and Urich, Herb. Trin. 4771, Debe valley, 26.8.1892 ; Sandwith 1711, Easterfield road, Tobago, 11.10.37

(K) ; Simmonds, Herb. Trin. 13861, Mt. St. Benedict, 17.12.46 (T, K) ; Simmonds, Herb. Trin. 13863, Diego Martin, 10.7.47 (T).

Trinidad and Tobago.

General and common, especially on cultivated trees (e.g. the immortelles of cacao plantations) and at forest margins.

Tropical South and Central America and West Indies northwards to Dominica.

A very variable species ; I have not attempted varietal determinations.

13. **Monstera obliqua** (*Miq.*) *Walp.* Ann. (1849), 761 ; Engler and Krause in Engl. Pflzr. 4, 23 B (1908), 103.

M. fendleri Engler in Engl. Bot. Jb., 37 (1905), 116.

Fendler 736 (K) (type of *M. fendleri* Engl.) ; Crueger (?), Cocorite, 5.10.1846 (T) ; Crueger (?), Caroni Woods, 14.2.1847 (T) ; Broadway, Herb. Trin. 7354, Los Bajos, Erin, 12.11.15 (T) ; Britton, Freeman and Nowell 2603 (=Herb. Trin. 10523), forest, vicinity of Tabaquite, 26–8.3.21 (T, K) ; Williams, Freeman and Cheesman, Herb. Trin. 11250, road to Maracas Bay, 10.7.25 (T) ; Sandwith 1798, Back Hill above Charlotteville, Tobago, 16.10.37 (K) ; Simmonds, Herb. Trin. 13862, Heights of Aripo, 9.2.47 (T, K) ; Simmonds, Herb. Trin. 13864, Piarco Savanna, 3.8.47 (T) ; Simmonds, Herb. Trin. 14021, Mt. Aripo, 24.12.47 (T).

Trinidad and Tobago.

General, but much less common than the preceding.

Guiana, Brazil, Bolivia.

14. **Monstera irritans** *Simmonds*, sp. nov.

Scandens ; lamina folii plantae juvenculae ovato-cordata, inaequilatera, adultae oblongo-ovata, venis infra patentibus ; foramina nulla vel paucissima ; petioli graciles, supra medio sulcati, leviter alati ; pulvinus subteres ; spatha mucronata, decidua, testaceo-brunnea ; spadix cylindricus, basin versus attenuatus, apice rotundatus ; baccae unispermae apice cellulis crebris irritantibus instructae.

Plant climbing. *Juvenile shoots* slender, closely applied to the support ; internodes about 2 cm. long ; leaves asymmetrically ovate-cordate, sinus small, 5 mm. deep, usually closed, lobes rounded, apex rounded-mucronate, dark green with greyish-white interveinal flecks, from 3 × 2 cm., increasing gradually in size and changing form as the stem climbs. *Mature internodes* 2–7 cm. long, 8–9 mm. thick, covered with a scaling periderm in dried material. *Petioles* 20–30 cm. long, 3–4 mm. broad, channelled above and slightly winged, broadened to a clasping base below and including a slender unchannelled pulvinus 1–3 cm. long above. *Blades* not or slightly fenestrate, asymmetrically oblong-ovate, up to 40 × 20 cm., subacute at the apex, rounded retuse at the base, commonly tearing along the veins on drying ; main lateral veins 8–10, making an angle of about 45° with the costa, slightly prominent beneath (in dried material), the costa itself very prominent, 2 mm. broad. *Spadices* solitary, on peduncles 6–8 cm. long and 3 mm. broad in the middle, thicker at the ends. *Spathe* pale brown before anthesis, shortly mucronate, the surface dull and smooth, deciduous in young fruit. *Flowering spadices* cylindrical, slightly tapered at the base, rounded and untapered at the apex, 6·5 × 1·5 cm. *Flowers* 2–3 mm. broad, 4–5 mm. deep, subhexagonal in section, densely packed ; stigma (in dried material) a dark brown raised line ca. 1 mm. long. *Fruiting spadices* massive, cylindrical, 10 × 2·5 to 13 × 3·3 cm., tapered at the base (basal flowers commonly sterile), rounded at the apex, green when immature, brownish-orange later. *Fruits* 10–13 mm. long, 5 mm. broad, the basal 2/3 occupied by the solitary seed, the apical 1/3 containing a white mass of long, slender, pointed, irritant cells, oriented longitudinally with respect to the axis of the fruit and surrounding a small, persistent stylar cavity. *Seeds* about 8 × 5 mm., with a thin, smooth, leathery testa.

Broadway, Herb. Trin. 5388, Botanic Gardens, 1.9.1893 (T) (sterile, a series of juvenile and mature leaves) ; Freeman, Herb. Trin. 8096, Grande Riviere, 1913 (T) (juvenile) ; McLean, Herb. Trin. 7724, Diego Martin, 13.5.15 (T) (juvenile) ; Broadway, *sine num.*, Tabaquite, 4.10.18 (K) (juvenile) ; Broadway *sine num.*, Maraval, 5.3.26 (K) (juvenile) ; Britton and Broadway 2813, Siparia Quarry, (K) (juvenile) ; Simmonds, Herb. Trin. 13880, nr. Sangre Grande, 13.6.47 (T) (juvenile) ; Simmonds Herb. Trin. 13879, Sans Souci, 17.9.47 (T) (sterile, mature) ; Simmonds, Herb. Trin. 13878, San Juan Estate, Montserrat, 1.10.47 (T) (fruit) ; Simmonds, Herb. Trin. 14196, Cap de Ville, 29.2.48 (T, type) (flower).

Trinidad ; endemic so far as known. See Journ. Ecol. 38, 290 (1950).

Generally distributed and locally common. It sometimes attains great size and vigour but is present in many localities as the sterile juvenile form only, whose obliquely-cordate, mottled leaves have a very characteristic appearance. Even when mature foliage is found, flowers are rare and tend to be formed high up and out of reach. The broad, untapered fruiting spadix is unlike that of any other *Monstera* I have seen. The species is named for the irritant cells formed abundantly in the apex of the gynoecia as the fruits ripen. *Jenman* 5765, Rupununi River, British Guiana, Oct. 1889 (K) (with immature and mature foliage but no flowers), might be the same.

15. **Montrichardia arborescens** (*L.*) *Schott*, Araceen Betreff. **1** (1854), 4.

Engler in Engl. Pflzr. 4, 23 C (1911), 124.

Crueger (?) without locality or date (T) ; Finlay, Herb. Trin. 1991, Cocorite, Jan. 1866 (T) ; Eggers 5890, Lambeau River, Tobago, Nov. 1889 (K) ; Alexander, Herb. Trin. 4564, 1891 (T) ; Broadway, Herb. Trin. 5087, Caroni River, 2.1.1893 (T) ; Alexander, Herb. Trin. 6860, " Toucoutche " (?), 1898 (T) ; Dannouse, Arima, Nov. 1904 (T) ; Hart, Gov't House gardens, March 1908 (T) ; Tredholm, Cocorite, 12.9.06 (T) ; Fielden, Government House, 22.6.10 (T) ; King, Herb. Trin. 7130, Cedros, 21.9.15 (T) ; Britton, Point Cumana, 20.3.21 (T) ; Simmonds, Herb. Trin. 13867, Sans Souci, 3.1.47 (T) ; Simmonds, Herb. Trin. 13868, Maracas bay, 30.3.47 (T, K).

Trinidad and Tobago.

Locally abundant in saline coastal marshes and at the mouths of rivers.

Tropical northern South and Central America, and West Indies from Martinique to Trinidad.

The var. *aculeata* (Meyer) Engl. differs from the typical plant in its greater height, spiny stems, rough petioles and the veins more exposed in the sinus. Field work in Grenada, B.W.I., suggested that the variety is a good one though there is little difference in size, and there is intergradation of spininess. A distinction is not normally possible in the herbarium, however. It is possible that an ecological difference exists, the typical form preferring freshwater sites, the var. *aculeata* saline or at least brackish water ; and it is desirable that this point should be observed by collectors. I have only seen the species in coastal localities in Trinidad, but several of the sheets cited above are evidently from inland.

16. **Dieffenbachia** cf. **seguine** (*Jacq.*) *Schott*, Melet., **1** (1832), 20.

Engler in Engl. Pflzr. 4, 23 DC (1915), 45.

Fendler 739 (K).

Trinidad.

Tropical South and Central America and West Indies.

A variable species, understanding of which is confused by the numerous cultivated forms. *Fendler* 739 does not match any specimen in Herb. Kew. really satisfactorily but is probably this species.

17. **Dieffenbachia** cf. **picta** (*Lodd.*) *Schott* in Oest. Bot. Wochenbl. (1852), 68.

Engler in Engl. Pflzr. 4, 23 DC (1915), 48.

Simmonds, Herb. Trin. 13869, Heights of Aripo, 9.2.47 (T, K) ; Simmonds, Herb. Trin. 13870, Arena Forest Reserve, 24.4.47 (T) ; Simmonds, Herb. Trin. 14386, Guaico-Valencia Reserve, 8.6.49 (T).

Trinidad.

Generally distributed and locally abundant in damp, shady, lowland localities.

Northeastern tropical South America.

Flowering is very rare and represented only by Herb. Trin. 14386.

18. **Dracontium foecundum** *Hook. f.*, Bot. Mag. (1885), t. 6808.

Engler in Engl. Pflzr. 4, 23 C (1911), 42.

Broadway 9214, Buenos Aires, Erin, 22.2.33 (K).

Trinidad.

Rare ; in the south-western peninsula only.

British Guiana.

19. **Xanthosoma jacquinii** *Schott*, Melet. **1** (1832), 19. Wild Tannia.

Engler and Krause in Engl. Pflzr. 4, 23 E (1920), 47.

Broadway 4433, Englishman's Bay, Tobago, 15.11.1912 (K) ; Broadway, 13.1.1915 (T) ; Broadway, Herb. Trin. 7841, Royal Botanic Gardens, 15.2.1915 (T) ; Britton and Britton 2208, Matchepoorie, 11.3.21 (K) ; Broadway 5562, Maracas Falls, 27.2.25 (K) , Sandwith

1901, Parlatuvier, Tobago, 24.10.37 (K) ; Simmonds, Herb. Trin. 13873, Maracas Valley, 27.12.46 (T, K) ; Simmonds, Herb. Trin. 13874, Heights of Aripo, 9.2.47 (T).

Trinidad and Tobago.

General, and common in damp shaded ravines and forest.

Tropical northern South and Central America and West Indies north to Puerto Rico.

This is a good wild species with massive, fleshy sprawling stems up to 10 feet in length, and is never cultivated. Indeed, local tradition has it that the plant is poisonous, but Engler and Krause state that it is widely cultivated. Probably *X. sagittifolium* (L) Schott and *X. violaceum* Schott have been confused here. The greyish latex and evil odour are diagnostic.

20. **Xanthosoma helleborifolium** (*Jacq.*) *Schott* in Oest. Bot. Zeitschr. **15** (1865), 33.

Engler and Krause in Engl. Pflzr. 4, 23 E (1920), 61.

Fendler 737 (K) ; Finlay, Herb. Trin. 1994, 4.6.1865 (T) ; Broadway, Herb. Trin. 10166, Royal Botanic Gardens, 26.7.22 (T) ; Broadway 6340, Tabaquite-Rio Claro road, 19.7.26 (K) ; Simmonds, Herb. Trin. 13875, Caurita Valley, 13.7.47 (T) ; Simmonds, Herb. Trin. 13876, St. Augustine, 15.8.47 (T, K).

Trinidad.

General though not common ; a weed of cultivation.

Tropical northern South and Central America and West Indies.

21. **Caladium bicolor** (*Ait.*) *Vent.* Jard. Cels., t. 30.

Engler and Krause in Engl. Pflzr. 4, 23 E (1920), 31.

Broadway, Herb. Trin. 8227, Royal Botanic Gardens, 24.6.16 (T) ; Broadway 6315, St. Augustine, 23.6.26 ; Simmonds, Herb. Trin. 13865, St. Augustine, 4.6.47 (T) ; Simmonds, Herb. Trin. 13866, St. Augustine, 23.6.47 (T, K).

Trinidad.

Locally very common as a weed of cultivation and probably much more widespread than the sheets suggest.

Tropical South America and West Indies.

Leaves green or spotted red at the insertion of the petiole ; rarely more strongly pigmented except in cultivation as an ornamental. The leaves die back in the dry season and spring with the first rains ; flowering comes about a month later but fruit has never been seen to set in Trinidad.

22. **Philodendron giganteum** *Schott*, Syn. (1856), 89.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 59.

Crueger, Herb. Trin. 1800, Arima (T) ; Broadway 4539, Mason Hall, Tobago, 20.5.13 (K) ; Broadway 6596, Arima-Blanchisseuse Rd., 25.3.27 (K) ; Simmonds, Herb. Trin. 13892, Maracas, 8.12.46 (T) ; Simmonds, Herb. Trin. 13894, El Cerro de Maracas y las Cuevas, 13.4.47 (T) ; Simmonds, Herb. Trin. 13895, Piedra blanca-Naranja, 23.2.47 (T, K).

Trinidad and Tobago.

Common and general in forest, terrestrial and climbing.

West Indies.

Fendler 740, cited by Engler and Krause as this species, is *P. accrescens*. *Broadway* 4539 has been determined as *P. simsii* Kunth ; this is a nearly-related species to which *P. giganteum* might ultimately have to be reduced.

23. **Philodendron fendleri** Krause in Engl. Pflzr. **4,** 23 DB (1913), 118.

Fendler 745 (K, type) ; Broadway, Herb. Trin. 4409, Botanic Gardens, Nov. 1890 (T) ; Hart, Herb. Trin. 4987, Botanic Gardens, 1892 (T) ; Broadway 1912, Government House, 7.11.07 (K) ; Broadway, Government House, 23.10.11 (K) ; Britton and Britton 2090, Valencia, 4.3.21 (T) ; Simmonds, Herb. Trin. 13893, Sans Souci-Grande Rivière, 3.1.47 (T, K).

Trinidad.

General , terrestrial or climbing in forest.

Endemic, so far as is known.

24. **Philodendron rubens** *Schott*, Syn. (1856), 84.

P. tobagense Engler in Engl. Bot. Jb. 27, (1899), 524.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 52 and 61.

Fendler 734 (K) ; Hort. Kew., June 12, 1878, from Crueger (K) (juvenile form) ; Broadway 4493, Caledonia Lot 42, Tobago, 28.4.13 (K) ; Broadway, Herb. Trin. 7849, Siparia, 13.3.15 (T) ; Britton, Britton and Freeman 2130, Brazil (K) ; Williams and Cheesman, Herb. Trin. 10794, Arima, '25.9.24 (T) ; Broadway 5984, junction of Blanchisseuse and Las Lapas roads, 26.2.6. (K) ; Broadway 6213, Morne Bleu, 16.5.26 (K) (juvenile) ; Simmonds, Herb. Trin. 13901, Piedra blanca–Naranja, 23.2.47 (T, K).

Trinidad and Tobago.

General in forests.

Venezuela.

This species has, apparently, been known only from garden specimens from Venezuela (Schott) and Trinidad (Crueger). *Fendler* 734 cited by Engler and Krause (*loc. cit.* p. 52) as *P. tobagense*, however, belongs here and I have no hesitation in reducing the latter species. The warty petioles are characteristic and in this it agrees with the evidently nearly related *P. asperatum* C. Koch.

25. **Philodendron accrescens** *Simmonds*, sp. nov.

Scandens ; internodia stirpis junioris tenuia ; lamina folii plantae juvenculae ovata et petiolus alatus ; hic adultae supra planus infra convexo-rotundatus, illa cordata leviterque basi excisa sinu aperto. Spatha apicem versus attenuata summo apice acuminata ; spathae tubus intus sanguineus. Ovaria 6–7-locularia, loculis multiovulatis, ovulis amphitropis ; baccae carnosae, coccineae.

Plant climbing, resinous. *Juvenile stems* with slender internodes about 8 cm. long, and ovate-lanceolate leaves, 15 × 6 cm. or less, up to 25 × 12 cm., broadest below the middle, acuminate ; petiole winged nearly to the top. *Older stems* with internodes 1 cm. long, 2 cm. thick, clothed in the persistent fibrous remains of petioles and prophylls. *Petioles* up to 50 cm. long, 1·5 cm. broad, winged only at the extreme base, flat above, the margins slightly raised, convex beneath, smooth, flushed reddish-purple at junction with lamina and tending to break at this point in dried material. *Leaf blades* smooth and shiny, cordate, the lobes rounded, the apex shortly acuminate, up to 43 × 34 cm., the margin wavy ; sinus broad and open 8, cm. deep ; main lateral veins about 14, slightly prominent beneath, clustered and spreading but not exposed at the sinus, 2·5 cm. apart apically and pointing forwards. *Spadices* solitary on peduncles 6 cm. long, 4 mm. thick at base, thickening to 10 12 mm. distally, pink below, whitish above at junction with spathe. *Spathe* thick, fleshy, persistent, brittle, 10-12 cm. long, the tube crimson, the tapering, acuminate blade greenish flushed with pink dorsally, later white. Axis of spadix tapered, 8–9 cm. long, 8 mm. broad, female flowers inserted upon the basal 3 cm., sterile flowers upon the adjacent 1 cm., male flowers upon the apical 4-5 cm. Male flowers 0·5 mm. in diameter, sterile flowers about 1 mm., all, with the axis that bears them, rotting off in advanced fruit. Female flowers white, 2 mm. broad. 3 mm. deep, with a pale reddish stigmatic disc ; ovaries 6-7-locular, with numerous, stalked, axile, amphitropous ovules. *Infructescence* ovoid, 7 × 4·5 cm. *Fruits* 6 × 4 mm., scarlet, fleshy, with numerous, minute, whitish seeds.

Fendler 740 (K) ; Simmonds, Herb. Trin. 13890, Long Stretch, 26.12.46 (T) ; Simmonds, Herb. Trin. 13891, head of Caura Valley, 9.3.47 (T, K) ; Simmonds, Herb. Trin. 14256, Long Stretch, 15.1.49 (T, type).

Trinidad.

Locally common in wet forests in the northern parts of the island.

Endemic. For notes on distr. see Journ. Ecol. 38, 289 (1950).

Fendler 740 was determined by Krause as *P. giganteum* but clearly belongs here. The petiole plano-convex in section is very characteristic, as also is the habit of climbing with slender stems bearing juvenile leaves (*Herb. Trin.* 13891 (T)), the internodes shortening and thickening greatly at flowering. The description and figures are based on all Herb. Trin. specimens, together with the relevant field notes and on notes of fruit characters made on an unpreserved gathering from Cleaver Wood, Arima, 25.10.47.

26. **Philodendron krugii** *Engler* in Engl. Bot. Jb., **26** (1899), 538. Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 85.

McLean, Herb. Trin. 6383, Diego Martin (T) ; Britton and Broadway 2816, Siparia, 8.4.21 (T, K) ; Broadway 6266, Oropuche local road, Valencia 7.5.26 (K) ; Broadway 6964, Maracas, road to Waterfall, 1.6.28 (K) ; Simmonds, Herb. Trin. 13900, Gasparillo Maracas trail, 13.4.47 (T, K) ; Simmonds, Herb. Trin. 13899, Arena forest reserve, 24.4.47 (T, K) ; Simmonds, Herb. Trin. 14385, forest, Matura–Valencia, 8.6.49 (T, K).

Trinidad and Tobago.

General, in forest.

Endemic.

Seitz 85 (Tobago) and *Eggers* 5765 (Tobago) are cited by Engler and Krause ; I have seen no authentic material.

27. **Philodendron rudgeanum** *Schott*, Syn. (1856), 78.

P. cannifolium (Rudge) Engl., *non P. cannifolium* Mart.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 6.

Fendler 744 (K) ; Dannouse, Laventille, 15.5.02 (T) ; Dannouse, Arima, 1.2.09 (T) ; Broadway 5770, Brazil via Guanapo, 4.9.25 (K).

Trinidad.

Guianas.

28. **Philodendron latifolium** *C. Koch*, Ind. Sem. Hort. Berol. (1855) App. 3.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 81.

Fendler 746 (K) (juvenile) ; Broadway 4504, Mason Hall, Tobago, 6.5.13 (K) ; Swabey, Herb. Trin. 12907, Salybia Bay, 3.6.33 (T) ; Simmonds, Herb. Trin. 13896, Galera point, 1.1.47 (T, K) ; Simmonds, Herb. Trin. 13902, Arima to San Rafael, 7.9.47 (T).

Trinidad and Tobago.

Common throughout the island except in the driest parts ; in forest, second growth and on cultivated trees.

Venezuela.

I have seen only N. E. Brown's notes and tracings in Herb. Kew., but make the determination with some confidence, nevertheless.

29. **Philodendron scandens** *C. Koch et H. Sello*, Ind. Sem. Hort. Berol. (1853), App. 14.

P. oxycardium Schott, Syn. (1856), 82.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 56.

Crueger, Herb. Trin. 5907, Tucuche, 3.2.1857 (T) (juvenile) ; Broadway, Moruga road, 9.7.19 (T) (juvenile) ; Britton, Seaver, van Ingen and Broadway, 8.4.21 (T) ; Simmonds, Herb. Trin. 13897, Piedra blanca–Naranja, 23.2.47 (T, K) (juvenile) ; Simmonds, Herb. Trin. 13898, Arima–Blanchisseuse road, 20.4.47 (T, K) (juvenile and mature but sterile) ; Simmonds, Herb. Trin. 13903, Arima–Blanchisseuse road, 17.8.47 (T, K) (in flower and fruit) ; Simmonds, Herb. Trin. 14349, Rio Claro–Mayaro road, 15.4.49 (T) (flower).

Trinidad.

General, in the wetter parts of the island and locally abundant at forest borders and in cacao fields.

Guatemala (*ex* Engl. and Krause), Venezuela (*ex* Schott), and West Indies.

P. scandens (of which flowers have never been described) is the juvenile form of *P. oxycardium* but, as a name, has priority. The species very rarely flowers although it is locally abundant. *Simmonds*, Mt. St. Catharine, Grenada, B.W.I., 1.9.47 (K), seems to be a new record for the island.

30. **Philodendron karstenianum** *Schott*, Syn. (1856), 78.

P. broadwayi N. E. Brown in Kew Bull. (1912), 343.

Engler and Krause in Engl. Pflzr. 4, 23 DB (1913), 15, 19.

Broadway 3880, Englishman's Bay, Tobago, 10.7.12 (K) (type of *P. broadwayi* N. E. Br.) ; Broadway, Caledonia, Tobago, 13.6.13 (K) ; Broadway, Herb. Trin. 7167, Cedros, 29.9.15 (T) ; McLean, Herb. Trin. 7747, Blue Basin, 13.5.15 (T) (juvenile) ; Broadway 5442, Quare River forests, Valencia, 10.10.24 (K) ; Broadway 6214, Morne Bleu, 16.5.26 (K) ; Williams, Herb. Trin. 12027, Morne l'Enver reserve, 27.8.28 (T) ; Simmonds, Herb. Trin. 13904, Piedra blanca–Naranja, 23.2.47 (T, K) ; Simmonds, Herb. Trin. 13905, Morne Bleu, 20.4.47 (T) ; Simmonds, Herb. Trin. 13906, Maracas Valley near the Falls, 16.5.47 (T) ; Simmonds, Herb. Trin. 13907, Naranja–Piedra blanca, 10.8.47 (T).

Trinidad and Tobago.

General in the wetter forests and especially common at about 2000′ in the Northern Range.

Northern tropical South America.

P. broadwayi seems to be a small (? lowland) form of *P. karstenianum* and one grades into the other.

31. **Syngonium vellozianum** *Schott* var. **oblongisectum** *Engl. ex Engler and Krause* in Engl. Pflzr. **4,** 23 E (1920), 127.

Fendler 738 (K) ; Alexander, Herb. Trin. 5597, Carenage, April 1893 (T) ; Broadway, Herb. Trin. 7620, Moruga, La Fortune trace, 14.2.16 (T) ; Britton and Broadway 2795, forest, Siparia Quarry, 8.4.21 (K).

Trinidad.

General, but rare.

Northern tropical South America.

32. **Typhonium trilobatum** (*L.*) *Schott* in Wien. Zeitschr. **3** (1829), 72.

Engler in Engl. Pflzr. 4, 23 F (1920), 117.

Hort. Trin., 1906 (T) ; Broadway, St. Clair Experiment Station, 25.7.19 (T) ; Broadway 6992, Botanic Gardens, " wild ", 9.7.28 (K) ; Simmonds, Herb. Trin. 13877, St. Augustine, 16.7.47 (T).

Trinidad.

An alien, naturalized locally.

Tropical Asia.

The Trinidad plant is var. *genuinum* Engl.

33. **Pistia stratiotes** *L.* Sp. Pl., **1** (1753), 963.

Crueger, Herb. Trin. 2242, Botanic Gardens, Jan. 1850 (T) ; Broadway, Herb. Trin. 8954, Irois, 23.11.16 (T).

Trinidad.
Floating in ponds, etc.
Pantropical.
Perhaps a naturalized alien in Trinidad.

Doubtful and rejected species.

Calla palustris L. is represented by *Herb. Trin.* 2241 (det. T. S. Hazen). The sheet bears neither date nor locality ; and the original label is in an unknown handwriting. The sheet is attributed to Crueger in the Herbarium register, which seems unlikely.

Philodendron micans (Klotzsch) Schott is recorded from Tobago by Engler and Krause (Pflzr. 4, 23 DB (1913) 59). The species is probably a juvenile form which has sometimes been cultivated as a foliage-plant ; flowers have never been described.

Cultivated Plants.—L. H. Bailey's Manual of Cultivated Plants, published in 1923, has long been esteemed as a handy reference-book, especially by those not fortunate enough to have access to the standard encyclopedias such as Baileys own Standard Cyclopedia of Horticulture or Nicholson's Illustrated Dictionary of Gardening. A revised and much enlarged edition of the Manual* is therefore sure of a warm welcome.

The full title of the book, " Manual of Cultivated Plants Most Commonly Grown in the Continental United States and Canada ", defines its scope, but it should be noted that horticultural varieties are not included and the book is confined to species and a few hybrids. Altogether 5347 species are keyed and described—albeit briefly—but still more are mentioned incidentally. Having regard to the set limits of the work a surprisingly wide variety of plants is included, no fewer than 1523 genera and 194 families being represented. It is interesting to note that quite a number of common British wild plants are included, for example the primrose, cowslip, and oxlip, *Campanula glomerata*, *C. rotundifolia*, and *Viola riviniana*, and that mention is made of one of our rarietis, *Erica mackaiana.*

A valuable feature of the work is that keys are provided to families, genera, and species, and these seem clear, straightforward, and easy to use—practical in fact. Particular attention has been paid to the nomenclature of the plants, in order to bring it into line with modern interpretations under the International Rules. This has had at least one unfortunate result—namely the transference of the name *Amaryllis* from the Cape Belladonna (the plant generally known as *Amaryllis Belladonna*) to the plants generally known as *Hippeastrum*, and the inclusion of the Cape Belladonna in *Brunsvigia*, as *B. rosea.* This conforms to the practice of American horticultural writers, but is not accepted by professional botanists in this country. Not only is there ample evidence to show that the Cape Belladonna is the plant to which the name *Amaryllis* properly belongs, but also the plant is quite clearly generically distinct from *Brunsvigia.*

Preceding each family is an illustration, comprising a number of line-drawings to show features of the family. These should prove useful to those who may be unfamiliar with the group concerned.

J. ROBERT SEALY.

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*L. H. Bailey, Manual of Cultivated Plants, Revised Edition. pp. 1116 fig. 195. Macmillan Co. New York. 1949. £4 7s. 6d.

MANNA AND ITS SOURCES.

S. G. Harrison.

Introduction.

Mannas have been known from the earliest times, particularly in Asia Minor, where some mannas are still regularly used in the preparation of local sweetmeats, which are highly esteemed. Others are better known for their medicinal, mainly laxative, properties.

The word manna has been used very generally to describe saccharine exudations from a number of different plants, belonging to various families. Some of these exudations consist largely of the hexahydric alcohol mannite or mannitol, associated with the sugars mannmotriose and manneotetrose ; in others the principle sugars are sucrose and dextrose, and mannite is absent.

In some instances the term manna is applied to the entire organism, as, for example, certain edible lichens and fungi. In other types of manna, the word is applied to substances which are actually of animal origin and are only produced indirectly from plants, although often confused with direct exudations from the plants themselves.

The different kinds of manna may be briefly summarized as follows:—

I. **Plant.**

A. Cryptogams.

Various lichens and fungi have been mentioned in the literature on this subject, the term manna being usually applied to the entire organism and not to any exudation.

B. Phanerogams.

(i). Direct Exudation occurring naturally without any apparent stimulus, e.g. *Myoporum platycarpum* R. Br., in which the cause of the secretion remains obscure. In other instances the exudation may be attributable to minute insect punctures which are not easily observed.

(ii). Direct Exudation, artificially produced by man-made wounds This is the method used in the commercial production of manna from the manna ash (*Fraxinus ornus* L.), the trees being tapped through incisions made in the bark.

II. **Animal.**

(i). Indirect Plant Exudation, being excretion by Aphids or Coccids which feed by sucking up plant juices. This type of manna, an example of which is that produced from certain species of *Tamarix*, is analogous to the honey dew formation which is a familiar phenomenon in this country.

(ii). Animal. A type of manna more obviously of animal origin is Trehala manna, which consists of cocoons of *Larinus nidificans* (*Coleoptera*), found on *Echinops* spp.

It may be seen from this short introduction that mannas are extremely diverse in their origin—as they are also in their composition.

The use of the word " manna " for any particular substance appears to be purely arbitrary, although it seems to be based essentially on the idea that manna is a " gift from God ". The term has therefore been applied to diverse substances which apparently " came from Heaven ", in the sense that they were found on the ground or on trees, shrubs or herbs, as though they had simply fallen out of the sky. This conception of a Heavenly gift has centred around Biblical countries, most mannas having been found in Asia Minor.

BIBLICAL MANNA.

The earliest references to manna occur in the Old Testament and have therefore long been known to both Jew and Gentile ; whilst for the followers of the Prophet, the Koran also contains a brief narrative.

" And when the dew that lay was gone up, behold, upon the face of the wilderness there lay a small round thing, as small as the hoar frost on the ground . . . . And when they did mete it with an o'mer, he that gathered much had nothing over, and he that gathered little had no lack . . . . . And Moses said, Let no man leave it till the morning . . . . but some of them left it until the morning, and it bred worms and stank . . . . . And they gathered it every morning . . . . and when the sun waned hot, it melted . . . . And the house of Israel called the name thereof Manna : and it was like coriander seed, white ; and the taste of it was like wafers made with honey " (Exodus XVI. 14–36).

" And the manna was a coriander seed, and the colour thereof as the colour of bdellium " (Numbers XI. 7–9).

" And we caused clouds to overshadow them, and sent down upon them the manna and the quails————" The Koran, Sura vii–Al Araf.

These descriptions are vague and may be too inaccurate to afford any real clue to the identity of the substance in question.

An organism which at one time was generally accepted as being the Biblical manna is the Lichen, *Lecanora esculenta* Evers, found on rocks and stones in the lands between Asia Minor and the northern Sahara, along with *L. esculenta* var. *jussufii.* At certain times these lichens may be broken up by drought and winds into small particles, which lodge in cracks in the ground, or accumulate in the lee of bushes as detritus, following violent winds or rain.

It has been pointed out that the lichens do not " appear with the dew, breed worms, nor melt in the sun ", all of which are characters descriptive of many of the fungi, *sensu stricta,* rather than of the lichens.

Hence a theory has been held that the manna of the Children of Israel was actually a fungus (12). A substance which apparently answers to the original description was noted on the plateau between Lakes Tanganyika and Nyasa, where it was gathered by the Amamburi tribe who called it " the Food of God ". It was white, very similar to porridge, and had to be gathered before sunrise as it melted in the sun and became full of worms if kept overnight. It was sweet to the taste and resembled coriander seed. It is unfortunate that this traveller's tale is not known to have been substantiated by the production of a specimen of the substance, but it has led one author to assume that it might be a "mushroom spawn ", without suggesting any possible genus. Arguments were put forward to show that it was not at all improbable that this Central African " manna " might also occur in Arabia.

In 1927 an expedition from Jerusalem University set out to demonstrate the identity of manna by a sojourn in the desert on the Sinai Peninsula. After some weeks of observation and experiment they concluded that Biblical manna was a phenomenon familiar in other countries as honey dew, a sweet excretion produced by Aphids and Coccids, liquid at first but later solidifying. The two coccids mainly responsible for manna in the Sinai Peninsula are stated to be *Trabutina mannipara* Ehrenb. and *Najacoccus serpentinus* var. *minor* Green, both on *Tamarix nilotica* var. *mannifera* Ehr. No manna was observed on other species of *Tamarix*. The expedition showed that fluid is ingested from the phloem vessels by the insects and excreted as a clear liquid, crystallizing in the dry desert climate and covering the branches or falling to the ground as the white grains of Bibilical manna. Other species of *Tamarix* are recorded as producers of manna, but production is often confined to certain areas, which would explain the failure of the Jerusalem University Expedition to find manna on more than the one species in the Sinai Peninsula.

One argument against *Tamarisk* manna being that of the Scripture is that substances which are used today as either drugs or sweetmeats would hardly suffice as the staple food of a people for any length of time. This argument would apply similarly to any of the other modern mannas. Possibly the miracle of the Old Testament was the presence of a sweetmeat in sufficient quantities to form a welcome and nourishing addition to the diet of people having to exist on very frugal supplies of food. We all realize how necessary appetisers are in times of rationing, to make a monotonous diet more palatable.

The nomadic people of many parts of Asia Minor live very similarly today, subsisting mainly on their flocks and herds and regarding "natural" additions to their diet, such as fungi, lichens and mannas, as " Gifts from God ". It is possible that the manna of the Bible was actually more than one substance, the description being of a conspicuous type and symbolic of the whole. Fossil stumps have been found which indicate that at the time of the Exodus the Sinai Peninsula was a wilderness of Tamarisk trees and bushes and not a bare desert.

A LIST OF SPECIES RECORDED AS PRODUCERS OF MANNA.

Cryptogams.

Fungi.

Certain fungi have been associated with manna on the grounds that they contain the sugar, trehalose, which is the chief sugar of trehala manna (see *Echinops* p. 408). Trehalose has been found, for example, in *Boletus edulis* Bull. ex Fr. (*Polyporaceae*) and in *Lactarius piperatus* (Scop. ex Fr.) Fr. (*Agaricaceae*).

In addition to the larger fungi, instances are recorded of the occurrence of this sugar in the *Mucorales* and Yeasts, (also in *Myxomycetes*).

Lichens.

Certain species growing in Asia Minor, notably *Lecanora esculenta* Evers and *Lecanora affinis* Evers, have been supposed to be the manna of the Scriptures. In some parts of the world today lichens are still collected for human consumption and are regarded as manna, in the biblical sense. A specimen of *L. esculenta* in the Museum collection at Kew is stated to be found on the sides of the mountains in Persia (Iran), and largely eaten by the poor in times of famine. This specimen consists of irregular, wrinkled, slightly flattened pellets, averaging about 10 mm. in two planes and about 6 mm. in the third. Although the outer surfaces of the pellets are now pinkish-grey it is probable that this is due to ageing, the inside being still pinkish white. A specimen of *L. affinis* in the same collection is generally about half the size of the previous species, darker on the outside with a whitish core, and with small white-tipped protuberances in addition to folds and wrinkles. This particular specimen came from Anatolia, where the natives called it " manna " and used it to make a kind of bread. Apparently it can only be obtained after a heavy fall of dew, which governs the local belief that it actually fell with the dew.

Moghadan (18) mentions *Chlorangium jussufii* Rabh., which is a synonym of *Lecanora esculenta* var. *jussufii* Stur. (*Parmelia esculenta* Sprol., *Lecanora desertorum* Krumphr. and *Lichen esculentus* Pallas are other synonyms of *Lecanora esculenta* Evers, which are to be found in literature on the subject). Moghadan states that *Chlorangium jussufii* is collected in the deserts of Persia and made into a type of bread, which is sold in the bazaars of Teheran and elsewhere as " Schirsad " and is supposed to encourage lactation.

Gymnosperms.

Coniferae.

Larix. So far as is known the only family in this group which produces manna is the *Pinaceae*, the most important species being larch, *Larix decidua* Mill., the course of Briancon manna, which contains the sugar melezitose. The earliest mention of Briancon manna appears to be in 1542, when it was listed in the Paris Customs Tariff as Manna Brianzona or Manna Brigantiaca. Briancon (France) remained the only source of supply until 1919, when larch manna was discovered in Switzerland. It is evidently secreted by aphids, as are the honeydews of lime and poplar trees, which also contain melezitose, and is in fact the undigested residue of carbohydrates from the sap sucked out of the foliage by the insect, in this instance probably by the aphid *Lachnus laricis* Walk.

In one of the Kew Museums there is a specimen dated 1864, obtained by Daniel Hanbury near Chantemerle in the Hautes Alpes, Dauphiny. It consists of amorphous crumbs, brown in colour, no doubt with age. A more recent specimen, still fairly white in colour, is that obtained by Prof. A. Henry in Switzerland in 1923 (10). Here the crumbs are preserved *in situ* where they have been deposited on the foliage of the larch. Larch manna is rare and costly. It was at one time used as a mild purgative. It has also been used as a culture medium in bacteriology.

Manna has also been found on Western larch, *Larix occidentalis* Nutt., for example, in the year 1898 in British Columbia. These two species of larch appear to be the only members of the genus from which manna has been recorded.

Pinus. The Bhutan pine, *Pinus wallichiana* A. B. Jacks, syn. *P. excelsa* Wall. and the Chir pine, *P. roxburghii* Sarg., syn. *P. longifolia* Roxb., in the Himalayas, produce manna which is collected and eaten or used to adulterate honey. It has been stated that the production of manna is usually quite small and large exudations only occur once in 20 or 30 years. Watt (19) notes that exudations from *P. wallichiana* occur from the tips of the twigs and cement the needles into clotted masses, which, melting in the sun, encrust leaves, twigs and stones around the trees with a varnish like covering. It seems probable that it is of aphid origin.

Pinus lambertiana Dougl. is mentioned by Moghadan. This is the Sugar Pine of N. America, the popular name being a reference to a sugary secretion from the trunk, which is not known to have been termed manna. The pine mannas have not been extensively examined and no chemical analysis of them is known to be available.

Pseudotsuga. Douglas Fir manna was first discovered in 1914 in British Columbia, where it is confined to dry alpine valleys and is only produced in hot summers. It resembles larch manna in appearance and also contains a high percentage of melezitose. Prof. A. Henry notes that this is of interest, in view of the close affinity between *Larix* and *Pseudotsuga*. A specimen of sugar deposits on twigs of *Pseudotsuga taxifolia* (Poir.) Rehd. (*P. douglasii* Carr.), which was obtained in British Columbia, was received at Kew in 1929. This particular specimen has not, however, been analysed.

Cedrus. The Cedar of Lebanon is mentioned by both Moghadan (18) and Watt (19), but the latter probably confused it with *C. deodara* Loud. Manna from Cedar of Lebanon has been described as bitter and unpleasant, which may indicate that the substance referred to was partly of a resinous or terebinthine nature. The National Standard Dispensatory of 1905 referred to Lebanon manna as " small sweet grains obtained from *Cedrus libanotica* Link. ", but no recent accounts or records of Cedar manna have been found.

Angiosperms.

1. *Tamaricaceae.*

Tamarix. Tamarisk manna has long been known in Iran and Armenia, where it is collected for use in native sweetmeats and as a drug. Hooper ennumerated the manna yielding species of *Tamarix* in 1909 and recorded details of native names and the uses to which the mannas had been put (14). From the records available it is not always easy to ascertain the exact species to which particular statements apply. It seems clear however that mannas are produced by at least four species and probably one or two others about which the records are less precise. Tamarisk manna is produced in Arabia, Iran, Baluchistan, Afghanistan and parts of Central Asia. It is exported to certain Moslem countries, e.g. to India, formerly, probably now to Pakistan, for use as a drug, considered to be a mild laxative.

In Iran, sweets called " gazangabin " are prepared from manna or " gez ", mixed with rosewater, flour and pistachio nuts. The word gazangabin has also been applied to products prepared from *Cotoneaster*, *Alhagi* and *Salsola* mannas. Production of Tamarisk mannas appears to be somewhat local. For instance, that of *T. aphylla* (L) Karst. (*T. articulata* Vahl.) is only recorded from Baluchistan, Afghanistan, Arabia, and Iran, although the species is said to be widely distributed in the Punjab, Egypt, Somaliland and Western Asia. A specimen of Gazangabin from this species is in one of the Kew museums. Originally it was in the India Museum. Unfortunately the place of origin of this specimen cannot be ascertained.

References to *Tamarix gallica* L. are somewhat confused. It has been stated that a variety, *T. gallica* var. *mannifera* Ehr. is a source of manna only in south eastern Iran. It is the chief producer of the "Gaz" used in the manufacture of Gazangabin and is exported from Iran in considerable quantities. It is believed that this manna is the result of punctures formed by *Coccus manniparus* which attacks this species in Iran, Arabia, Afghanistan and Egypt. Manna from this species of *Tamarix* has not been reported in many parts of its range, which includes India and China. It is not certain whether this is due to the absence of the Coccid from these areas or whether it may indicate that the species is represented there by a different variety which for some reason does not enable Coccids to produce manna.

T. pentandra Pall. (*T. pallasii* Desv.) is widely distributed in Baluchistan where it yields a sweet gum which is sometimes classed as a manna (15). A specimen of this, which is in a collection of Persian Drugs at Kew, is a sweet amorphous mass, resembling glue or brown treacle in colour and of the consistency of a stiff dough.

T. macrocarpa Ehr. ex Bunge is said to occasionally bear a "saline incrustation", which may actually be a manna.

An account of the manna of *Tamarix nilotica* Ehr. has already been given. It seems probable from the descriptions available that most, if not all, Tamarisk mannas are insect secretions of the honey-dew type. Hooper states that India Museum specimens were examined and found to contain a large percentage of reducing sugars but no mannite.

2. *Celastraceae.*

Gymnosporia. In 1913 a specimen of this genus, probably *G. deflexa* Sprague, was received at the Imperial Institute from north western Rhodesia, bearing a white incrustation of "manna". This was further examined and found to consist of 54% dulcitol, 6·4% dextrose sugar and 6·6% sucrose. Apparently the quantity of the residue was too small for further examination. (1). No repetition of the appearance of this manna has been noted.

3. *Leguminosae.*

Alhagi camelorum Fisch. (*A. persarum* Boiss. & Buhse), and *A. maurorum* Desv. (*Hedysarum alhagi* L.), are both known to yield manna but only the latter is represented in the Kew collection. There are two specimens; one is a dry brown dust, stated to be "A better and new variety received from Agra in 1876", the other consists of sticky, glistening brown tears, ranging in colour from light brown to almost black. The latter was collected in Afghanistan and presented by Dr. Aitchison in 1886. The uses of *Alhagi* manna are similar to those of Tamarisk, chiefly in the manufacture of sweets and as a mild laxative. According to Moghadan it is called Tarandjabine in Iran, where it is largely used in popular medicines. It is collected by shaking twigs over a cloth. Alhagi mannas have been discussed also by Chevalier (2).

Astragalus. It has been stated that two species of this genus were a source of supply of manna collected in the mountain districts of Chahar-Mahal and Faraidan (9), but no other records have been found.

Indigofera semitrijuga Forsk has been mentioned as a manna producing plant (2).

4. *Rosaceae.*

Cotoneaster nummularia F. & M. is the source of Shirkhist, a manna which is often confused with the Gaz of *Tamarix* and is used, like the latter, in the preparation of the sweet, gazangabin, in Iran. Shirkhist manna collected by Dr. Aitchison in Afghanistan is in the form of rough whitish brown cakes, about 2 in.-3 in. across, whilst another specimen of Shirkhist more nearly resembles Gazangabin in form, colour and consistency. There appears to have been some confusion between the raw material and the sweetmeats which are prepared from the manna.

5. *Combretaceae.*

Madagascar manna has been stated to be the secretion of a cricket, *Phremnia rubra* Signoret, which lives on bushes of the family *Combretaceae* (6).

6. *Myrtaceae.*

The mannas of this family, although not of great economic importance, have been the subject of a number of studies by Maiden and others in Australia.

The following have been recorded as producers of manna.

Leptospermum scoparium Forst. " Tea tree ". A small quantity of " manna " was reported on a twig in 1895, but was not analysed.

Eucalyptus. Mànna, in varying quantities, has been reported from a considerable number of species, not all confirmed. *E. cinerea* F. v. M., *E. cinerea* var *nova-anglica* Maiden, *E. corymbosa* Sm., *E. eximia* Schau., *E. foecunda* Schau., *E. gomphocephala* D.C., *E. gunnii* Hook., *E. mannifera* Mudie, *E. multiflora* Rich., *E. oleosa* F. Muell., *E. punctata* D.C., *E. resinifera* Sm., *E. rubida* Deane et Maiden, *E. stuartiana* F. Muell., *E. terminalis* F. Muell., *E. viminalis* Labill. (syn. *mannifera* A. Cunn.).

From the specimens available in the Kew collections it is evident that *Eucalyptus* mannas are of at least two distinct types. Specimens from *E. gunnii* and *E. multiflora* consist of whitish brown tears, resembling larch manna in appearance. It seems that this type is produced in times of drought through rupture of the cortical vessels of the tree. This is known to occur in *E. viminalis* and *E. rubida.* This type of manna dissolves readily in water and is stated by Maiden to be frequently taken as a pleasant purgative in some parts of Australia,—dose for a healthy adult 2½–3 tablespoons full. The action is claimed to be so mild that it may be administered to the smallest infant. The first manna to be noticed in Australia was that of *E. viminalis,* which has also been found in the Argentine (4). In the former country it was long confused with *E.rubida.* An entirely different type of manna is that produced on *E. oleosa.* which consists of flat wooly brown discs, about the size of a halfpenny, each composed of a number of flat cells in a honeycomb pattern, suggesting that each cell has been the home of one of the insects responsible for secreting the manna. This manna is termed " Lerp " and resembles that found on *E. rubida,* which is produced by a species of *Spondyliaspis* (*Psylla*), according to the paragraph on the zoology of mannas by Maiden (17).

Ordinary *Eucalyptus* mannas, in addition to those caused by drought, have been attributed to various insects, including *Cicadidae*, *Cercopidae* (Froghoppers), and *Coleoptera*.

7. *Compositae*.

Trehala manna, in which the chief sugar is trehalose, is the cocoon of the beetle, *Larinus nidificans*, produced on *Echinops persicus* Stev, and probably other species. There are specimens from three different areas in the Kew Museum collections. One is of Trehala or " Tihan " from Baghdad ; the plant source of which is not noted. Another is " Shek Roukeh ", which is recorded as being produced by the larvae of a Rhynchophorus insect on the " Tucee plant ", *Echinops* sp., at Kirrind, Iran. The appearance of this sample is very similar to the specimen from Baghdad. The third specimen is " Shukkur Tigal " from the East Indies, which is recorded as being " cocoons on *Echinops* sp., having a sweet taste ". The biology, chemistry and history of Trehala manna and trehalose are treated in some detail by Moghadan (18).

8. *Ericaceae*.

Rhododendron arboreum Sm. has been stated to be the source of a manna, but this has not been confirmed (19).

9. *Oleaceae*.

Fraxinus manna is probably the best known of all commercial mannas. It is produced chiefly from the Manna Ash, *Fraxinus ornus* L., a native of southern Europe, which is cultivated for the production of manna, especially in Sicily. Commencing when the tree is about ten years old, the stem is tapped by making daily incisions in the bark, from which the liquid manna exudes, congealing on the trunk. In wet weather it remains liquid rather longer and often falls to the ground, being then considered to be of inferior quality, although it may be caught on the flat branches of *Opuntia* placed beneath the tree to prevent the manna from becoming soiled. Alternate sides of the tree are incised for three years, after which the exhausted stem is cut down and two or more new shoots are allowed to grow up from the stump, to be ready for tapping again in ten years time.

There are a number of samples of Sicilian manna in the Kew museum, in the form of lumps or rods of varying sizes and varying in colour from almost white to a medium brown. The better quality mannas are flaky in consistency, the inferior grades are more agglutinated and darker in colour. A specimen of manna from *F. ornus* var. *rotundifolia*, from Madras, is similar to the Sicilian manna in appearance. The " Shirkhist " from *F. floribunda* Wall., from Lahore, and a manna from a species of *Fraxinus* in Herat are both brown and crumbly compared with the European Ash mannas of comparable age.

Fraxinus ornus manna has long been known and used as a gentle laxative. It consists of from 40% to 60% mannite, 6% to 16% manninotriose and 12% to 16% manneotetrose (7).

The olive, *Olea europea* L., is capable of exuding a manna, according to Moghadan.

10. *Asclepiadaceae.*

Calotropis gigantea R. Br. is contained in Watt's list of manna producing plants in India. It is said to be the source of the manna called "Shukuri Tighal".

Calotropis procera R. Br., as *Apocynum syriacum* S. G. Gmel., was noticed by Moghadan in a list of Persian herbs compiled by Schlimmer in 1874, but not verified as a manna producing species.

11. *Scrophulariaceae.*

Melampyrum nemorosum L. is referred to by Watt as being the source of "Madagascar manna", but this has not been confirmed.

12. *Myoporaceae.*

Myoporum platycarpum R. Br. was first recorded as a source of manna in Australia in 1882 and was long known to be a food of the aborigines in the interior. In 1892 the exudate was regarded by Maiden to be a perfect substitute for European Ash manna, but it has remained neglected until quite recently, when investigations were commenced by the Council of Scientific and Industrial Research (Australia) with the intention of determining the potential value of the exudate as a source of mannitol for industry. It has been shown that 60% to 70% of the total solids in this manna consist of mannite, but unfortunately *M. platycarpum* cannot be made to exude manna by mechanical injury, as in the commercial production of Ash manna. In fact, the reason for the natural exudation remains a mystery, as it has been observed that manna production by this species is not always associated with the presence of insect bores. It has been suggested that the presence of a yeast and two species of bacteria may provide the key to the problem, but as yet no positive experimental results have been obtained (5).

13. *Chenopodiaceae.*

Salsola foetida Del.

Manna from this species is noted by Watt and was described by Aitchison in Iran (14).

14. *Polygonaceae.*

Atraphaxis spinosa L. is the source of a manna called "Schirkhecht" in Iran (18). It is stated to be found in mountainous regions near Teheran in the form of white viscous grains about the size of peas and is used as a laxative and purgative in local medicine.

15. *Fagaceae.*

Quercus. Oak manna is known to occur on *Quercus incana* Roxb. and *Q. persica* Jaub et Spach, and may also occur on other species. It is collected in Iran and Irak, where it is used to make confectionery; in particular, a type of nougat is prepared by clarification of the manna and the addition of sugar, white of egg and nuts. This is sold in the form of small, flattened, round cakes of a light buff colour. The manna itself is marketed as dark greenish brown lumps flecked with buff coloured particles. The specimens in the museum at Kew include some which were collected in 1947. All are hard and brittle and similar in colour.

Manna from *Q. vallonia* is noted by Deerr (3) but in the absence of an authority it is uncertain whether the species referred to is actually *Q. aegilops* L. or *Q. cerris* L.

16. *Salicaceae.*

Salix. Moghadan notes the occurrence of mannas on *Salix fragilis* L., *S. persica* Boiss., and *S. tetrasperma* Roxb. The only specimen of *Salix* manna at Kew was collected from an unidentified willow at Quetta, Baluchistan, where the product is known as " Bed-khist ", probably derived from the Irani name " Bid-khecht ". In the environs of Teheran, manna is stated to form on the willow trunks in the form of viscous white globules, during the months of August and September. Production is variable and unreliable, and is believed to be independent of any insect interference. It is probably of the type initiated by the effect of the heat in summer. The manna is used chiefly in local medicine.

16. *Scitamineae.*

Ensete superbum (Roxb.) Cheesman (*Musa superba* Roxb.) is mentioned as a source of manna by Watt, but no details are available.

18. *Palmae.*

Again, Watt must be quoted. He simply tabulates " *Palmae*, various species ", in his list of manna plants, and no further details have been found.

19. *Gramineae.*

" Bamboo ". A bamboo manna was reported on the stems of *Dendrocalamus strictus* Nees in March 1899. It was in the form of short rods, white or light brown in colour, and was pleasantly sweet, the chief sugar being a saccharose, probably cane sugar. Its appearance was opportune, coming as it did at a time when India was in the throes of a serious famine, and the natives of those parts of the Central Provinces which were favoured by its presence were not slow to appreciate its palatability. It did not contain mannitol (13). A sugary exudation previously reported on *Bambusa arundinacea* Willd. and " *Bambusa verticellata* " has never been confirmed and may have been confused with " Tabashir ", a siliceous substance which is produced inside the stems of certain bamboos and has long been used in Indian medicine, as an aphrodisiac, stimulant, etc. It has been stated that manna from *B. arundinacea* is attributable to an aphid, *Oregma bambusae.* Further investigation would be desirable.

Dichanthium annulatum (Forsk.) Stapf (*Andropogon annulatus* Forsk.), an Australian Blue Grass, has produced a substance shown to consist principally of Mannite (17).

Phragmites communis Trin. is stated to have been the source of a manna collected by Indians in the State of California. No further details are known (8).

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International Rules of Botanical Nomenclature*.—In *Kew Bull.* **1948** (2), 172 (1948), we noticed the reprint of the International Rules, with the Amsterdam additions, issued by the Chronica Botanica Company in 1948. The same firm has now issued a report of the proceedings of the Symposium held at Utrecht in 1948, with the Amsterdam additions as a supplement. Two other supplements concern a proposed International Society of Plant Taxonomists, and the personnel of the International Commission for [Botanical] Nomenclature. The work is embellished with facsimiles of title-pages of earlier nomenclatural works, such as De Candolle's *Lois* (1867), and, though something of a " mixed bag ", will undoubtedly fulfil a useful purpose in connection with the Stockholm Congress.

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A NEW SPECIES OF BRIEYA FROM ANGOLA.

By A. W. EXELL.

Brieya latipetala *Exell*, sp. nov. *Arbor* 4 m. alta, ramulis brunneo-tomentellis. *Folia* breviter petiolata, petiolo incrassato, 2–4 mm. longo, tomentello, lamina oblonga vel oblongo-elliptica apice acuminata basi cordata, 11–22 × 5–10·5 cm., supra costa media excepta tomentella glabra subtus sparse pilosula demum fere glabra, costa media supra depressa tomentella subtus prominente pubescente, nervis lateralibus 11–16 paribus subtus prominulis. *Flores* solitarii (vel fasciculati ?) breviter pedunculati, pedunculo bracteolato, 4–10 mm. longo, brunneo-tomentello, in axillis foliorum dispositi. *Sepala* 3 transverse elliptica apice mucronulata, 3 × 4 mm., extus pubescentia intus glabra. *Petala* 3 exteriora late ovato-triangularia apice mucronulata, 3 × 2·5 mm., extus pubescentia intus glabra, 3 interiora lanceolata vel oblique lanceolata, 40–45 × 10–20 mm., juventute pubescentia demum glabrescentia. *Stamina* numerosissima, antheris 1·7 mm. longis, thecis apicem versus leviter divergentibus glabris, connectivo applanato glabro. *Carpella* 4 (an semper ?) oblonga, 2·5 × ·8 mm., sericea, ovulis circa 20 biseriatim dispositis. *Monocarpia* 4 (an semper ?) libera sessilia late cylindrica, 3–5 × 1·8–2·8 cm., glabra, seminibus 4–10 anguste reniformibus, 1–1·6 cm. longis.

ANGOLA : Lunda District, Dundo, near the River Luachimo, 700 m., 6 Jun. 1948, *J. Gossweiler* 14048 (Type in Kew Herbarium). " Shrub-like tree of 4 m. height, irregularly branched ; three inner petals of corolla green, turning white. Sporadic in humid gallery woods."

The genus *Brieya* De Wild. [Annonaceae] was described from the Belgian Congo (Ganda-Sundi) with one species, *Brieya fasciculata* De Wild. This was later collected by Mr. Gossweiler in the Mayumbe forest region of Cabinda and by Mr. C. Vigne in the Gold Coast (Fomang Su Reserve).

The new species here described has leaves closely resembling those of *B. fasciculata* but it can be at once distinguished from the latter by the lanceolate inner petals, nearly 2 cm. broad, the inner petals of De Wildeman's species being strap-shaped and less than 10 mm. broad (rarely exceeding 7 mm. in the material seen). The broad inner petals give the plant more the appearance of a *Piptostigma*, a genus closely related to *Brieya*, but the monocarps are quite free, the principal character distinguishing *Brieya* from *Piptostigma* in which the monocarps are coalescent at the base.

Brieya was described as having 6–4 ovules in each carpel. There were at least 20 in each of the carpels of *B. latipetala* dissected but this difference is probably not of great significance. The number of ovules is very variable in *Piptostigma*.

The collection from which the species was described was made by Mr. Gossweiler in the extreme north of the Lunda District of Angola near the frontier with the Belgian Congo. Riverine forest seems to be well developed in this region and to show considerable affinity with the west African rain-forest of Cabinda and Gaboon. Among several interesting new records for Angola contained in this collection, the remarkable *Phylloclinium paradoxum* Baill., with epiphyllous inflorescences, is noteworthy.

A NOTE ON PARADISEA, DIURANTHERA AND NOTHOLIRION.

WILLIAM T. STEARN.

The genus *Paradisea* was based by Giovanni Mazzucato in 1811 on a European species, *P. liliastrum* (L.) Bertol., syn. *Hemerocallis liliastrum* L., *Liliastrum album* Link. St. Bruno's Lily, as this plant is sometimes called in allusion to its occurrence on the mountains of Dauphiné where Bruno (1030–1101) founded the Carthusian Order, is a well known member of the *Liliaceae* subfamily *Asphodeloideae* tribe *Asphodeleae*. Its stout roots spring from a compact rootstock, not from a bulb ; the leaves are numerous and basal, the flower-stem bracteate, unbranched, leafless, with a one-sided raceme of a few short-pedicelled rather funnel-shaped white flowers having the anthers deeply indented at base, the ovary ovoid, the stigma slightly swollen but not trifid ; the capsule has wingless angled seeds. It grows at 5,500 to 7,800 feet in the Pyrenees, the Jura, the Alps and the Apennines ; a sketch-map by Suessengüth of its distribution is reproduced in H. Meusel, Vergleichende Arealkunde, **2,** K. 55 (1943). In Portugal there is a related plant which has been called *Paradisea liliastrum* var. *lusitanicum* P. Coutinho, *P. lusitanicum* (P. Cout.) Sampaio, *Anthericum lusitanicum* (P. Cout.) Sampaio, *Liliastrum lusitanicum* (P. Cout.) Rothmaler.[‡]

The real founder of this genus was Tournefort who defined it with precision in his Elemens de Botanique, 296, t. 194 (1694) and Institutiones, 369, t. 194 (1700) under the name *Liliastrum* signifying " une plante qui aproche du Lis ", not " lily-star " or " star-lily " as sometimes stated ; the suffix *-astrum* is a variant of the usually derogatory suffix *-aster* (incompletely resembling) found in such words as *philosophaster* (a bad philosopher), *pinaster* (a wild pine), *oleaster* (a wild olive) etc. Linnæus adopted Tournefort's generic name as a specific epithet under *Hemerocallis* in 1753 and *Anthericum* in 1762, but Ortega in his Tabulae Botanicae, 26 (1772), 2nd ed. 78 (1783), an exposition of Tournefort's system as opposed to the Linnæan system of classification, re-instated *Liliastrum* in generic rank, as Link did later. *Liliastrum* thus has priority over *Paradisea* and was adopted by Rothmaler in Fedde, Repert. **49,** 55 (1940) in place of this. The name *Paradisea*, in the amended form *Paradisia* proposed by Bertoloni, Fl. Ital. **4,** 134 (1839 41), has, however, become so widely known and is adopted in so many floras, encyclopaedias and standard taxonomic reference works such as Bentham and Hooker's Genera Plantarum and Engler and Prantl's Pflanzenfamilien, that its conservation is obviously desirable, and has been formally proposed by Janchen.

It should be noted that this name commemorates an Italian botanist, Giovanni Paradisi (1760–1820), a senator of Modena, and has no direct connexion with " Greek *paradise*, a garden or garden of the future world " as erroneously stated in a well-known and generally reliable manual of cultivated plants. The original description, reprinted below, occurs in a work of extreme rarity, Viaggio botanico all' Alpi Giulie ; Lettera del Professor Mazzucato (Udine, 1811) :—

[‡] According to Rothmaler the distinctions between the two species are as follows :— *P. liliastrum*, leaves to 8·5 mm. broad, inflorescence one-sided, flowers about 5 cm. long, pedicel not articulated ; *P. lusitanicum*, leaves 7 to 18 mm. broad, plant more robust, 60 to 150 cm. high, inflorescence not one-sided, flowers 2·5 to 3 cm. long, pedicel articulated (cf Fedde, Repert. **49,** 174 : 1940).

" *Hexandria.* PARADISEA MAZZ. *Monogynia.*

Genus novum

Cal : o. Cor: 6. petala, campanulato-cylindrica. *Stam*: declinata. *Caps*: ovata.

PARADISEA HEMEROANTHERICOIDES

P. radice fasciculata carnosa, foliis planis sub-gramineis, scapo simplicissimo, corollis campanulato-cylindricis secundis. *Mazz.*

Hemerocallis Liliastrum scapo simplici, corollis hexapetalis campanulatis. *Linn. sp* : *plant* : I. p. 324. *Hort* : *cliff* : 128. *Miller dict* : n. 4.

Hemerocallis floribus spicatis secundis. *Haller. helv.* N.1230.

Anthericum Liliastrum foliis planis, scapo simplicissimo, corollis campanulatis, staminibus declinatis. *Lepech* : *it.* I. p. 197. *Kniph. cent.* 7. n.30. *Willd. spec* : *pl.* T.2, p.I. p. 142.

Liliastrum alpinum majus, & minus. *Tournef* : *inst* : 369. t. 194.

Phalangium magno flore. *Bauh* : *pin.* 29.

Phalangium allobrogicum majus. *Clus*: *cur. app* : *alt.*

Phalangium. *Dalecamp*: *hist*: p. 852.

Paradisea—Giglio selvàtico—Giglio di Monte

Abitat in alpibus, presertim in pascuis montis *Sutrii*, loco vulgo dicto *Stuart.*

Perennis. Floret junio.

Characteres generici Hemerocallis, atque Antherici huic plantae communes, novum genus postulant. Habeant in hoc Botanici virtutum eximiarum viri excellentissimi Comitis Senatoris PARADISI monumentum."

Most authors have considered *Paradisea* a monotypic genus but in 1922 Alexander Lingelsheim (1874–1937) greatly enlarged its definition to accommodate three Asiatic species. Two of these were the plants of western China which constitute the genus *Diuranthera*, *i.e.* *D. major* Hemsley and *D. minor* (C. H. Wright) Hemsley. The third was a new species, *Paradisea bulbulifera* Lingelsh., based on a specimen collected in eastern Tibet by Dr. Wolfgang Limpricht* ; in Die natürlichen Pflanzenfamilien, 2nd ed. **15**d., 279 (1930) Dr. K. Krause accepted this species as the sole member of *Paradisea* sect. *Archi-Paradisea* Lingelsh.

Lingelsheim divided the enlarged genus *Paradisea* into three sections, i.e. sect. *Eu-Paradisea* (*Paradisea* sensu stricto) typified by the European *P.*

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*In 1914 Limpricht made a plant-collecting journey across western China to Tatsienlu (Kangting) and Batang (Paan) in eastern Tibet. Later he visited other regions of China and by the time of his return to Germany in 1920 had amassed a herbarium of over three thousand gatherings. These he took to Breslau (now Wroclaw). Here and at Berlin and Coburg they were identified " rasch und energisch " by a team of German botanists, some of whom had then little experience with Chinese plants. An enumeration edited by Ferdinand Pax appeared in 1922 as part of Limpricht's " Botanische Reisen in den Hochgebirgen Chinas und Ost-Tibets " (Fedde, Repert. Beih. **12**). Subsequent investigation of his specimens, the first set of which was deposited at Breslau, has led to considerable reduction in the number of supposed new species as well as the correction of many misidentifications. In 1940 Limpricht accordingly published a supplementary paper entitled " Umbestimmungen und Namensänderungen in Aufzählung der von Dr. W. Limpricht in Ostasien gesammelten Pflanzen " (Fedde, Repert. **50**, 214–231) listing all the rectifications known to him. This list contains no reference, however, to *Paradisea bulbulifera* Lingelsh.

liliastrum, sect. *Diuranthera* containing the two Chinese species, *P. minor* C. H. Wright (syn. *Diuranthera minor* (C. H. Wright) Hemsley) and *P. major* (Hemsley) Lingelsh. (syn. *D. major* Hemsley), and sect. *Archi-Paradisea* based on *P. bulbulifera*. *Diuranthera* is unlike *Paradisea* in habit, has smaller flowers, with the anthers prolonged at base into two short appendages (whence the name), and rounded somewhat disc-like seeds ; it merits the generic rank given it by Hemsley in Hooker, Icones Pl. (4) **8,** t. 2734 (1902). Lingelsheim's third section *Archi-Paradisea* must also be excluded from *Paradisea*. It is in fact synonymous with the genus *Notholirion* and so belongs to the *Liliaceae* subfamily *Liliodeae* tribe *Lilieae**. Lingelsheim's detailed and accurate description of his *P. bulbulifera* notes the presence of minute brownish bulbils at the base of the stem, a feature certainly not to be expected in *Paradisea* and other members of the *Asphodeleae* but which characterizes *Notholirion.* The bulb in this genus is tunicated, and consists of a few membranous scales formed from dried leaf-bases surrounding a few rather fleshy scales which never possess a lamina ; stalked bulblets are formed on the inside of these scales. The bulb takes several years to reach flowering size and, after flowering, perishes, leaving a host of bulblets around the base of the stem. Misled by the general resemblance in habit of his Tibetan plant to the European *Paradisea,* Lingelsheim interpreted the stem-base as being rhizomatous and did not realize that the " Blattanlage " there were the exhausted remnants of a bulb. Moreover he had no mature capsule available. He observed, however, that the flowering stem was leafy, the anthers entire and versatile, the ovary cylindric with very numerous ovules, the stigma trifid. These features likewise characterize the genus *Notholirion,* of which one species, *N. hyacinthinum* (Wils.) Stapf, has often been collected in western China and adjacent Tibet. Lingelsheim's *Paradisea bulbulifera* undoubtedly belongs to this species. The type-specimen may no longer be in existence but it was carefully examined by Dr. Harry Smith of Uppsala in 1936 and identified by him then as *N. hyacinthinum* ; he reports that it was " a good complete specimen representing the normal plant ". E. H. Wilson described and illustrated this in 1925, under the name *Lilium hyacinthinum,* from the upland meadows round Tatsienlu, between 1000 and 1200 feet, scarcely a hundred miles south-east of the locality, " Dawo (Ressenyi), zwischen Muru und Girseh gomba, 3800 m.", where Limpricht collected *Paradisea bulbulifera.* Unfortunately Lingelsheim's epithet has priority over Wilson's and thus has to be transferred to Notholirion :—

Notholirion bulbuliferum (Lingelsh.) Stearn

Paradisea bulbulifera Lingelsheim in Fedde, Repert. Beih. **12,** 316 (1922) ; K. Krause in Engler, Nat. Pflanzenfam. **15a,** 279 (1930).

Lilium hyacinthinum Wilson, Lilies E. Asia, 100, t. 15 (1925).

Notholirion hyacinthinum (Wilson) Stapf in Kew Bull. **1934,** 96 ; Cotton in Royal Hort. Soc., Lily Year Book, **3,** 18, fig. 5 (1934) ; Grove & Cotton, Suppl. Elwes' Mon. Lilium, 131, t. 29 (1940) ; Woodcock & Stearn, Lilies of World, 377, fig. 124, 134 (1950).

Liliastrum bulbuliferum (Lingelsh.) Rothmaler in Fedde, Repert. **49,** 55 (1940).

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*cf. F. Buxbaum in Bot. Archiv, **38,** 389 (1937).

The species is distributed from western China, over south-eastern Tibet, northern Assam, Bhutan and Sikkim to Nepal.

The writer is indebted to Dr. Harry Smith (Uppsala) for information about the type-specimen of *Paradisea bulbulifera*, to Prof. Charles Baehni (Geneva) for a transcript of the original description of the genus *Paradisea*, and to Mr. J. R. Sealy (Kew) for constructive criticism of the above note.

Summary. Lingelsheim's broad concept of the genus *Paradisea* is considered untenable. *Paradisea* sensu stricto, syn. *Paradisea* sect. *Eu-Paradisea*, is an exclusively European genus, from which Lingelsheim's Chinese section *Diuranthera* differs sufficiently to merit restoration to generic rank, while his Tibetan section *Archi-Paradisea* is synonymous with the genus *Notholirion*, having been based on a specimen of *N. hyacinthinum* (Wilson) Stapf. For this species the name *N. bulbuliferum* is adopted. The conservation of the name *Paradisea*, in the amended form *Paradisia*, is supported against *Liliastrum*.

Papers of the Michigan Academy of Science, Arts and Letters* — The thirty-third and thirty-fourth volumes for the years 1947 (1949) and 1948 (1950) of this publication, contain the papers submitted at the Annual Meetings of the Academy in 1947 and 1948. These are arranged under the headings Botany, Forestry, Zoology, Geography, Geology, Anthropology, Economics, History and Political Science, Folklore, Landscape Architecture, Language, Literature, Medical Science, Sociology and Philosophy. Included in the Botany and Forestry sections are papers on the " Dormancy and Germination of Seeds of the Bur Reeds, *Sparganium* spp.", " Studies in the genus Poria ", and " Some Resupinate Polypores from the Region of the Great Lakes ". The volumes which are well printed and produced are illustrated by a number of photographs, maps and diagrams, and each is provided with an author index.

H. S. MARSHALL.

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*Papers of the Michigan Academy of Science Arts and Letters. Edited by Eugene S. McCartney and Frederick K. Sparrow. Volume 33 (1949). Pp. x + 414 + ii. 1949. Price 60/-. Volume 34 (1948). Pp. xiii + 352 + iii. 1950. Price 55/-. Ann Arbor : University of Michigan Press. London : Geoffrey Cumberlege.

Anatomy of the Dicotyledons*:—In the editorial preface of the English translation of Solereder's "Systematic Anatomy of the Dicotyledons" the late Dr. D. H. Scott wrote: "Covering as it does, with marvellous completeness and exactitude, the most extensive and important division of the Vegetable Kingdom, the 'Systematic Anatomy' forms an indispensable work of reference . . . and serves . . . as by far the best source from which students may gain an idea of the objects and methods of this young and vigorous branch of Botany".

Those who were active in Botany at the time these words were written can best judge the progress of the "young and vigorous branch of Botany". Botanists of a younger generation will probably regard its advance as disappointing and feel that its vigour soon declined although, to be true, there has been one notable revival—the enormous interest in wood structure which started some thirty years ago and which has been maintained ever since. There is now, however, a quickening of interest in anatomy and perhaps a more realistic attitude towards its worth for taxonomic purposes, and the appearance of the new "Anatomy of the Dicotyledons", almost 42 years to a day after Scott's preface was written, is a notable botanical event, for it cannot but serve to stimulate such work, while its encyclopaedic treatment of the subject will prove invaluable both to the student and investigator.

The "Anatomy of the Dicotyledons" is not a new edition of Solereder, although it is based upon much the same plan. The biggest difference between the two books is the space which the newer one devotes to the mature secondary wood, deriving from the modern appreciation of the fact that anatomical data on timber must be obtained from mature wood and not based, like those of Solereder, on a study of small twigs. The "Anatomy of the Dicotyledons" forms the first comprehensive systematic survey of wood structure: it does great service in sorting and bringing together the vast amount of work, and too frequently undisciplined work, on this subject.

In general the anatomical data for each family follow a unified plan. There is first a general summary of anatomical characters, followed by a more detailed description of the leaf and the axis, information on the axis being divided, where applicable, into axes of a few season's growth, and the mature wood, i.e. timber. The term axis is used, apparently, in reference to subaerial axes, for roots and rhizomes are grouped together as a separate section, a procedure which, while indefensible on morphological grounds, is no doubt dictated by convenience. This section on root and rhizome is often very sketchy by reason of the scanty information available. There follow sections on Taxonomic Anatomy and on Economic Uses, while the concluding section, which is followed by a summary of the literature of the family, is headed "Genera described" and where occasion warrants consists of two lists, the first of genera from which the general anatomical data have been derived, and the other of genera on which the details of wood structure have been based.

The book concludes with valuable lists of families in which certain diagnostic anatomical features occur and in a bibliography of over 2,500 references to literature published since the appearance of the English translation of Solereder.

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*Anatomy of the Dicotyledons: by C. R. Metcalfe & L. Chalk, with the assistance of M. M. Chattaway, C. L. Hare, F. R. Richardson & E. M. Slatter. 2 vols. pp. lxiv + 1500, with 317 figures in the text. 1950. Clarendon Press, Oxford. £6 6s. net.

The arrangement of the families follows the system of Bentham and Hooker. Since no system of classification attains perfection the choice of arrangement was necessarily somewhat arbitrary. That adopted at least has the advantage of being the one which Solereder used, while it seems specially appropriate for a work originating at Kew.

Although Scott referred to the "marvellous completeness" with which Solereder covered the Dicotyledons it may be doubted whether the authors of the new book would choose to have their work thus described, although it exceeds its predecessor by some 300 pages, and keeps within these bounds only by a more condensed treatment, and by the omission of some of the minutiæ of detail in Solereder. The task which they set themselves was immense, even with the fruits of Solereder's pioneer labours at hand, and there is no doubt that much remains to be accomplished before the plant anatomist, like the systematist, can refer to a book as complete as "Die Natürlichen Pflanzenfamilien", for it is with such a book that the "Anatomy of the Dicotyledons" is most aptly compared. Perhaps the comment which best sums up the authors' task, and the manner in which it has been accomplished, is that in the foreword which refers to "a simplification of treatment that a mastery of detail can alone achieve".

It is no new thesis that classification should be based on as wide a range of characters as possible, and while it seems probable that floral characters will always form the main basis of classification in the Dicotyledons, there can be little doubt that such a classification will be on a firmer basis when full use is made of all the characters of the plants. Anatomical characters cannot, of themselves, form a basis for classification but rather an extension of, and a supplement to, the external morphological characters. Anatomy is sometimes helpful in specific determinations, but in general, for special and more trivial groups the data of the cytologist and geneticist are of greater value, while anatomy is likely to be more useful in determining the affinities of larger groups like families.

To what extent the taxonomist and systematist will make use of the wealth of data in this new book remains to be seen. As the authors point out, the anatomist has at times failed to realise the limitations of his subject and has drawn conclusions of a taxonomic nature which the taxonomist views with suspicion, while, at the same time, the taxonomist has not always appreciated the value of anatomical research. Nor, for that matter, do many anatomists cover their subject, but in general, fall into one of two groups—those who are wood anatomists and those who are not. This regrettable state of affairs must remain, it is to be feared, until plant anatomy and taxonomy are taught in a realistic way. The "Anatomy of the Dicotyledons" is a well-balanced book, and no criticism of this nature can be levelled against it ; the authors are not, they admit, taxonomists, but they have had ample opportunity for consulting with leading taxonomists and have taken full advantage of their good fortune. If the book succeeds in accomplishing a synthesis of anatomy and taxonomy it will serve Botany well and if it fails in this it will still remain the standard cyclopaedia of systematic and taxonomic anatomy for many years. F.W.J.

THE CULTURE OF IRIS EMBRYOS ON NUTRIENT AGAR.

E. M. SLATTER.

Cultivators and breeders of the bearded iris are only too familiar with the difficulties caused by the slow germination of the seeds of many hybrids. The causes of this dormancy in the iris seeds have been investigated by several botanists. Crocker (2) believed it to be due to mechanical forces round the embryo. Much more recently Cox (1) has demonstrated the presence of chemical substances in the endosperm which inhibit germination and the development of the young seedling. These substances, being very stable and relatively insoluble in water, cannot be removed by soaking the seeds before they are sown. Any method that shows promise of hastening germination would, therefore, be welcomed by all those who specialize in the cultivation and hybridization of the bearded iris. Various methods of storing and treating the seed in the hope of hastening and improving germination have been tried, but without marked success. We are, however, much indebted to Randolph and Cox (3) who have published details of experiments performed with the bearded iris over a period of years. They found that storage just above or just below freezing point, leaching in running water, chipping the seed to expose the radicle, and increasing the oxygen supply to the chipped seeds, increased germination from 15 to 64 per cent, whereas subjecting the seed to continuous low temperatures, or to alternating low and moderate temperatures, and planting in media with pH values of from 4·1 to 8·5 has no beneficial effect. Werkmeister (4), however, claimed that iris embryos can be cultured on a nutrient agar medium, and Randolph and Cox were also successful when using a similar method. In their experiments they found that intact seeds would scarcely germinate on agar jelly, and, if half of each seed was cut away before sowing, the embryos and seedlings were deformed because the part of the embryo in contact with the seed was unable to develop as quickly as that in contact with the jelly. However, they showed that, if the embryo is entirely removed from the seed and placed on the agar, it grows rapidly and forms a normal seedling. Since embryos treated in this manner start growing within a few days, plants can be raised and made to flower within a year. This discovery opens up great possibilities to iris breeders and horticulturalists generally. As this technique is not known to have been tested to any great extent in this country, and as it does not appear to be familiar except to iris specialists, it was decided to experiment with Randolph and Cox's method at the Jodrell Laboratory, Royal Botanic Gardens, Kew.

Technique.

For the experiments at Kew the culture medium was prepared as follows. Two stock solutions were made up and labelled A and B respectively. Their composition was as follows :—

Solution A.

Calcium nitrate Ca $(NO_3)_2 4H_2O$	23·6 gms.
Potassium nitrate KNO_3	8·5 gms.
Potassium chloride KCl	6·5 gms.
Distilled water	500 ml.

Solution B.

Ferrous sulphate $FeSO_47H_2O$	...	...	·2 gms.
Sodium hexametaphosphate $(NaPO_3)n$ ...		...	1·0 gm.
Magnesium sulphate $MgSO_47H_2O$	...	...	3·6 gms.
Distilled water	...	...	500 ml.

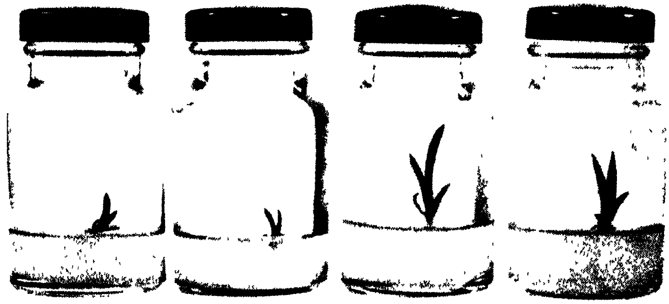
The salts in solution A dissolve immediately, but solution B was made up in two parts to prevent the formation of a precipitate. The iron and magnesium salts were dissolved in 250 ml. of water. Calgon, a proprietary substance which can be used in place of sodium hexametaphosphate, prevents the precipitation of iron and calcium salts and, at the same time, supplies a certain amount of phosphorus. It was dissolved in another 250 ml., and these two solutions were then mixed. Seven gms. of agar, 20 gms. of glucose and 5 ml. of each of the solutions A and B were dissolved in a flask containing a litre of distilled water, and treated in an autoclave at 15 lbs. for 20 minutes. (Some types of domestic pressure cooker would serve as a relatively inexpensive and reliable substitute for the autoclave if one were not available). Thirty ml. of the liquid were poured into each of a number of 4 oz. glass bottles with screw-on caps made of a plastic material and which had previously been treated in an autoclave at 15 lbs. for 20 minutes. The bottles and their contents were then treated in the autoclave again, the caps being loosely screwed down, both on this and the previous occasion. After allowing the bottles to cool, the caps were screwed down firmly.

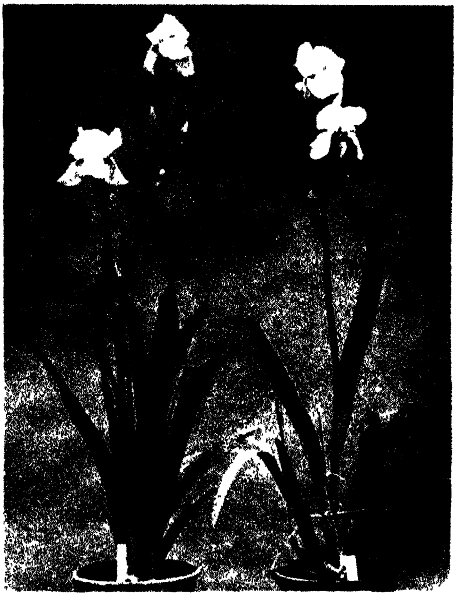
The seeds to be used were surface sterilized by soaking from 1-2 hours in an aqueous solution of sodium or calcium hypochlorite solution. This was prepared by mixing equal quantities of a domestic bleaching solution such as " Parozone " with water to which a small quantity of the spreading agent " agral x " had been added. The seeds were then washed thoroughly in sterile distilled water and left to soak for about a week, the water being changed daily.

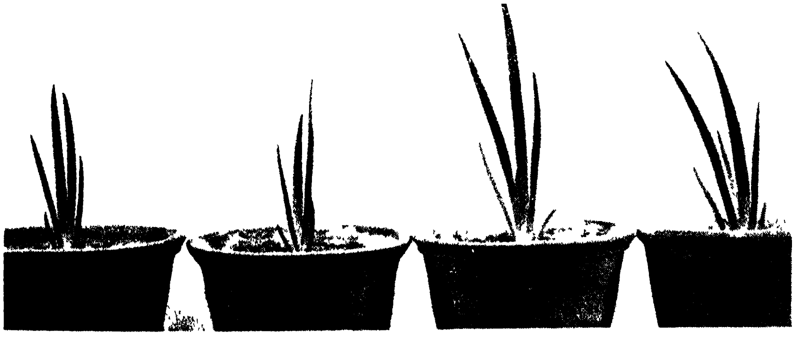
A secluded room was made as free as possible from contaminating fungi and bacteria by wiping all bench surfaces and sprinkling the floor with methylated spirit. Draughts were excluded as far as possible. During the subsequent dissection of the seeds, which is described in the next paragraph, all instruments were dipped in methylated spirit, and passed through the flame of a bunsen burner, and the fingers were frequently dipped in methylated spirit.

The soaked seeds were placed in 50 per cent alcohol for a few minutes. A cut was made opposite the micropylar end, dividing the seed into halves, thus exposing the embryo, which was then removed on the tip of a small scalpel and placed on the surface of the agar. Care was taken to keep the embryo out of contact with the alcohol and to put it, as quickly as possible, into the bottle whilst the latter was held horizontally. The cap was removed for as short a time as possible to minimize the risk of contamination. It was found that the embryos can be more readily removed if the scalpel is first moistened with sterile distilled water. The bottles, with their caps loosely screwed down to allow for slow gaseous exchange with the surrounding atmosphere, were placed in the dark for about a week at a temperature varying between 56°F. and 68°F. until the embryos had germinated. They were then brought into the light.

Plate 5.







Upper. A selection of bearded iris seedlings in agar cultures, 2 months old, heights ranging from 1·2–4·5 cms.

Middle. Two plants of bearded iris grown from embryos in agar flowering 18 months afterwards, height approximately 3ft. 8ins.

Lower. The same plants as above 2 months later, heights ranging from 12·7—17·5 cms.

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Unfortunately the weather then became very cold and the temperature dropped about 8°. However, after a few weeks the conditions improved and although the night temperatures averaged only 56°F. the day temperatures rose to as much as 90°F.

The technique described above was not found to be entirely satisfactory because fungal and bacterial infections were not always eliminated, so attempts to improve the method were accordingly made. Some of these tests, owing to the limited numbers of hybrid bearded iris seeds available, were made on seeds of the native species *Iris pseudacorus* which can be readily obtained in large quantities from wild sources. The species proved to be unsuitable, however, since the seeds and embryos are rather small compared with those of the bearded iris, and the endosperm remained hard and brittle even after soaking. It was not, therefore, easy to make the dissections quickly and the embryos were sometimes damaged and had to be discarded. The following modifications were tried.

(i). Seeds were surface sterilized with a 0·1 per cent solution of mercuric chloride instead of in " Parozone ".

(ii). The scalpel used to remove the embryos was sterilized by dipping in a 50 per cent. solution of hexylresorcinol as recommended by Randolph and Cox. Undiluted hexylresorcinol was also used.

(iii). Concentrations of 6-9 gms. of both shredded and powdered agar to a litre of water were used in the hope that fungal and bacterial growth would be less rapid on a firmer culture medium.

(iv). The embryos were sown on the agar culture medium in small tubes plugged with cotton wool, instead of in bottles, 15 ml. of the medium being placed in each tube. The tubes require considerably less space than the bottles, a point that would be of considerable importance if the method proved to be suitable for raising iris seedlings on a large scale.

(v). Embryos were sown in pots of sphagnum soaked in culture solution and kept moist with distilled water. The composition of the solution was the same as that used with the agar.

(vi). A comparison was made between seedlings grown in warm-humid and warm-dry conditions after transplanting from the cultures into the soil.

(vii). Embryo cultures were compared with the usual practice of sowing seeds in pans of suitable compost in a greenhouse.

Results.

The dissections in the preliminary experiment were made on February 1st 1947. Germination was rapid. After 4 days, radicles had begun to develop, and after a week were 2-3 cms. long. In 12 days young leaves appeared, and, at the end of the first month, they were about 1 cm. long, the plants by now having developed an extensive root system in the agar. After 2 months the seedlings, which ranged from 3-4 mm. to 3-5 cm. in height, were transplanted into pots of suitable compost. This was done with great care as the roots of the young seedlings were often long and assumed a coiled growth in the agar. The seedlings were gently removed from the bottles, and the roots, after being well washed in water to remove all traces of agar, were spread out on the potting compost. This consisted of peat, sand and loam in equal parts.

Leaf mould was excluded and celluloid labels used instead of wooden ones, both of these precautions being taken to reduce fungal growth.

The seedlings were grown in the pits used for raising tropical plants, as it was thought that the humidity and high temperature (85–95° F.) would favour their early growth. After 3 months, when they were about a foot high, the plants were hardened off in a temperate house (minimum temperature 55°F.) and planted out of doors in July, only 6 months after germination. In the spring of the following year 44 per cent of these plants flowered, and one plant flowered again in July.

The seeds used in this experiment were from the following crosses.

A. Iris Zampa × Mrs. George Warre.
B. (El Tovar × Eternal City) × Maiden Blush.
C. Purissima × Gudrun.
D. Killiney × Phebus.
E. Plicata alba × Ariadne.
F. Coronatum × President Mitchell.
G. Purissima's Son × Oriana.
H. Tenaya × Zingarella.
I. Old Gold × Prairie Sunset.
J. Purissima × Bruno.
K. Radiant × (El Tovar × Eternal City).

The embryos from the crosses A. E. F. H. and J all failed to germinate and many of these cultures were badly contaminated. From the other 6 crosses, however, there was 86 per cent germination, and of these, only 8 per cent died before being potted up.

In April 1947 embryos from those crosses which had previously failed were again cultured. The bottles were placed in an incubator at 65°F. (the temperature recommended by the American authors). This time 46 per cent of the embryos germinated, having probably been stimulated by the higher temperature. However, the cultures were again badly infected and none of the embryos survived.

In May and July of 1947 further batches of the successful crosses were cultured. Since the weather was very warm at the time the cultures were kept at room temperature instead of being placed in an incubator. Ninety-eight per cent germinated, but 13 per cent died before being transferred to pots. The seedlings were placed in a frame at a temperature of 80–100°F., but with a dry atmosphere. As the plants did not grow rapidly under these conditions they were transferred to the tropical pits where they developed well. They remained there over the winter and were then removed to a temperate house as before and planted out in July. One plant was then in flower, a year after the commencement of the experiment. In the spring of 1948, 71 per cent of these plants flowered.

The results of these experiments indicate that there are important differences between the seeds from the various crosses. The embryos of some hybrids show a considerable range of size, some being extremely small, and many are curved. The dissections are therefore more difficult to make and this increases the chance of contamination from the atmosphere and also damage to the embryo. However, it would seem that many of the embryos are already infected in the seed or incapable of developing. With seed that is free from this resistant form of contamination, however, and in which the embryos are of normal size and capable of developing, the agar culture method is a successful and speedy way of raising seedlings of the bearded iris.

The experiments already mentioned, in which attempts were made to improve the original technique, gave the following results.

(i). The comparison between mercuric chloride and " Parozone " for surface sterilization showed that both can be used with success. The " Parozone " solution, however, not only acts more slowly but also tends to soften the seed coat which is then difficult to hold during the subsequent dissection. The mercuric chloride solution has no softening effect on the testa and is therefore more convenient to use.

(ii). Neither concentration of hexylresorcinol was effective in reducing contamination with bacteria or fungi, but, if reasonable precautions against fungal and bacterial attack are taken, there is no great loss of plants through this cause. As has already been emphasized, the most significant fact is that the cultures that were badly infected were all from particular crosses, and no effective chemical treatment for dealing with these could be devised.

(iii). The concentration of agar was found to be important. Fungi and bacteria cannot develop so easily on hard, as they can on soft, agar. Also a firm agar has the advantage of being less liable to liquify in warm weather and so provides a more rigid support for the young plant. When the agar is too hard, however, the roots of the seedling are unable to penetrate it effectively. Of concentrations ranging from 0·6 to 0·9 per cent of both shredded and powdered agar, 0·8 per cent shredded agar was found to be the most satisfactory. The degree of firmness, however, appears to vary considerably according to the brand of agar, and the particular alga from which it is manufactured, so that the most favourable concentration depends on the type of agar used.

(iv). Rapid evaporation of moisture from the agar jelly, when it was placed in test tubes plugged with cotton wool, soon caused the culture medium to become too hard for the radicles to penetrate, and, in consequence, the seedlings were killed. In the experiments at Kew, 2 oz. screw cap bottles, each containing 15 ml. of culture medium, proved to be the most convenient containers for general use.

(v). Sand and Sphagnum placed in flower pots, moistened with nutrient solution without agar, and subsequently kept watered with distilled water, were not found to be satisfactory media in which to grow iris embryos.

(vi). After transplanting the seedlings from the culture bottles, those which were placed in the warm and humid atmosphere of the tropical pits developed much more quickly than those in the warm frame with a drier atmosphere. It is not advisable to make the change too quickly from the high atmospheric humidity in the bottles containing the agar to the less humid air conditions that prevail above the soil in a flower pot.

(vii). Comparison between whole seeds sown in pans of compost and agar cultures of seeds from the same cross that were started at the same time gave the following results. Seedlings averaging 2 cm. in height were obtained from 90 per cent of the embryos within a month, when the agar method was used. Seeds planted in soil, on the other hand, did not appear above the surface until 4 months had elapsed. Seed germination in soil continued sporadically, however, and, at the end of a year, 68 per cent of the seeds had germinated. It can be seen from the photographs that the plants raised from embryos do not differ in form or vigour from those grown from seed in the normal manner.

Conclusions.

The method of raising iris seedlings by cultivating the excised embryos has the definite advantage that it not only shortens the normal interval between seed-sowing and flowering, but, provided the embryos are viable and not contaminated in the seed, it also ensures that a higher percentage of plants will be obtained. The experiments show clearly that, in a given time, many more plants can be raised by the embryo culture method than by sowing seeds in the normal way, whilst the technique also enables the viability of any particular batch of iris seeds to be determined within a few days. Another advantage is that, under controlled conditions, seedlings can be raised at any time of the year.

The technique requires no special apparatus apart from an autoclave or suitable domestic pressure cooker, and is not difficult. If great care is taken at the two critical stages, that of the dissection itself, and later the transfer from culture bottle to soil, good results can be obtained, again provided the embryos are viable. It cannot be too strongly emphasized, however, that the experiments show quite clearly that the embryos of certain crosses cannot be made to germinate by this method, either because they are so heavily contaminated with bacteria or fungi, or because of their unstable hereditary constitution. Both of these aspects of the subject need further critical investigation. Further experiments with other culture media are also very desirable. For example it has been suggested that cherry agar might give better results because bacteria will not grow readily on this medium, but there has not yet been an opportunity to put this suggestion to the test. It is, therefore, to be hoped that this method will be further improved, and its use extended so that the work of cultivating and hybridizing the bearded iris will be less handicapped by the slow germination of the seeds.

I gratefully acknowledge the interest and help of Dr. C. R. Metcalfe during these investigations and in the preparation of this paper. I am indebted to Mr. C. P. Raffill for bringing this culture technique to my notice, for the seeds he kindly provided and for his valuable assistance in the raising of the young plants, and to other members of the Gardens Staff for their co-operation. I also wish to thank Mr. G. Atkinson for the photographs and Mr. Marsden-Jones for his kindness in collecting seeds of *Iris pseudacorus*. The suggested use of cherry agar made by Miss de Boer of Boskopp is much appreciated.

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TWO NEW SPECIES OF COLCHICUM.

B. L. BURTT.

The two species of *Colchicum* described below are not new discoveries; they have been passing for some years under the names *C. latifolium* Sibth. & Sm. and *C. sibthorpii* Baker. Mr. E. A. Bowles will discuss them more fully in the second edition of his Handbook of Crocus and Colchicum, which he is now preparing, but the recognition of these new species must be preceded by a brief account of the two names just mentioned. The descriptions are based largely on plants grown in Mr. Bowles's garden at Myddelton House, Enfield, and I am greatly indebted to him for a generous supply of material.

In their Florae Graecae Prodromus (1 : 250. 1806) Sibthorp and Smith determined a colchicum collected " in Helicone, Parnasso aliisque Graeciae montibus " as *C. variegatum* L. Later, however, (Flora Graeca 4 : 43, t. 350. 1823) they abandoned this identification and published the new species *C. latifolium* Sibth. & Smith. The specimen in question, now in the Sibthorp collection at Oxford and kindly sent on loan to Kew by Professor T. G. B. Osborn, consists of flowers only; the epithet *latifolium* is derived from the fact that Smith associated with these flowers the description given many years earlier by Clusius (Hist. Pl. 1 : 199. 1601) of a plant he called *Colchicum byzantinum latifolium polyanthes*. Smith had failed to note that Clusius's plant had already been made the type of *C. byzantinum* Ker-Gawl. (in Bot. Mag. sub t. 1028. 1807); consequently the name *C. latifolium* Sibth. & Sm. was illegitimate as originally published.

C. latifolium was not only a *nomen illegitimum*, it was also a *nomen confusum*, for the association of the leaves of *C. byzantinum* with the flowers collected by Sibthorp was false, as will be seen at a glance by comparing the illustration of *C. byzantinum* in the Botanical Magazine with the plate of *C. latifolium*. Baker recognized this and proceeded to rename the plant Sibthorp had collected *C. sibthorpii* Baker (in Journ. Linn. Soc. Bot. 17 : 427 : 1879). It will be as well to quote his text in full :—

" 9. C. SIBTHORPII, *Baker*.—C. latifolium, *Sibth. & Smith, Fl. Graec.* t. 350, quoad flores non folia. Cormus globosus 1½–2 poll. crassus, tunicis firmis castaneis longe supra collum productis. Folia 4–5 hysteranthia vernalia. Flores autumnales ad spatham plures. Perianthii tubus saepe semipedalis; limbus lilacino-purpureus obscure tessellatus 21–24 lin. longus, segmentis oblongo-oblanceolatis obtusis 8–9 lin. latis venis 20 vel ultra percursis. Stamina perianthio triente breviora, antheris 4 lin. longis. Styli antheras superantes, apice stigmatoso leviter curvati. *Graeciae in montibus Atticae*, Von Heldreich! *C. variegatum*, Sieber, Herb. Crete Exsicc.! non Linn., est forma imperfecte cognita, verisimiliter affinis."

In deciding what is to be regarded as the lectotype of *C. sibthorpii* it is necessary to recognize clearly the various elements combined in Baker's publication of the name. They are :—

1. The synonym *C. latifolium* Sibth. & Sm. Fl. Graec. t. 350 quoad flores non folia.

2. The specimens collected by Heldreich from which Baker described the flowers.
3. The specimen collected by Heldreich from which Baker described the leaves.
4. The uncertain synonym *C. variegatum* Sieber.

Clearly the last of these can be dismissed from consideration. So also can the specimen from which Baker described the leaves, for it is clear that he paid little attention to them, giving neither size nor shape ; further, the single specimen of leaves written up by Baker as *C. sibthorpii* came from Parnassus, not from Attica, and was almost certainly wrongly associated with Heldreich's flowering specimens. I consider that the leaves described by Baker belong to *C. parnassicum* Sart. et Boiss.

The lectotype of *C. sibthorpii* Baker must therefore be either Sibthorp's plant or one of Heldreich's flowering specimens. There are two objections to taking Sibthorp's plant as the lectotype, and these are sufficient to override the consideration that Baker called the species *C. sibthorpii* : first, Baker knew only the illustration in Flora Graeca, there is no evidence that he ever saw the specimen at Oxford ; secondly, we only have the indefinite locality, Helicon, Parnassus and other mountains in Greece. Baker clearly took his detailed knowledge of this species, as shown by his description of corm and flowers, from the herbarium specimens collected by Heldreich which he had before him at Kew. I therefore choose one of these named by Baker himself as the lectotype of the species :—

GREECE. Attica, in regione abiegna montis Parnethos, Sept. 1847, *Heldreich* (Herb. Hook. in Herb. Kew.).

With the identity of *C. sibthorpii* thus defined we can safely apply this name to a plant collected by Mr. E. A. Bowles at Tatoi, near the foot of Mt. Parnes, and grown by him at Myddelton House, Enfield. Now, therefore, for the first time we are able to describe leaves which belong without doubt to flowering specimens agreeing with the chosen type. The leaves of the Tatoi plant are 7–8 in number, about 20 cm. long and 1·6–1·8 cm. broad, strongly undulate on the margin when young and lying flat on the ground.

Twelve years after publishing *C. sibthorpii*, Baker illustrated a plant under the same name in Curtis's Botanical Magazine (t. 7181). This had larger, more globular flowers than the true *C. sibthorpii*, broader perianth segments, and leaves suberect and not undulated on their margins. The plants had come from Max Leichtlin and their precise origin was not given ; it is now clear, however, that this species, which can scarcely be considered the same as *C. sibthorpii*, is a native of the mountains of northern Greece and does not extend as far south as Attica. Mr. Bowles has it in cultivation from corms sent to him from Salonika. In confirmation of this we find under *C. callicymbium* Stearn & Stefanoff (Journ. of Bot. 1934, 343) the following quotation from a letter by R. Irwin Lynch " Leichtlin says that this *Colchicum* [i.e. *C. callicymbium*] must have come from the habitat of *C. Sibthorpii* [i.e. the northern plant], viz., 'the monastery of Hagios Dionysis next to Kraterino, Gulf of Salonica' ". It is described below as *C. bowlesianum* B. L. Burtt.

It is unfortunately not possible to discriminate sharply enough between *C. sibthorpii* and *C. bowlesianum* to enable all the herbarium material to be satisfactorily determined. The flowers lose so much of their character in being dried and not one of the specimens concerned has leaves collected from the same locality associated with it. It will be necessary to make a fresh start in order to trace the distribution of these two species. Flowering specimens should be lifted and grown on in the garden so that leaves can be obtained.

There is another colchicum, found in Crete, to which the name *C. latifolium* is still being applied. This Cretan plant is far more distinct from *C. sibthorpii* than is *C. bowlesianum.* Its flowers are shaped like a straight-sided funnel, without the curved outline found in *C. sibthorpii* and, to a greater degree, in *C. bowlesianum* ; the perianth tube is triangular. The leaves are very large and strongly plicate, a character in which it resembles *C. cilicicum* Dammer and *C. byzantinum* Ker-Gawl. This Cretan species is the plant which Sieber referred to *C. variegatum* L. and which Baker cited as a doubtful synonym of *C. sibthorpii.* It is not endemic to Crete, for it has also been found on the island of Rhodes on the other side of the Aegean Sea. That the plants from Crete and Rhodes belong to the same species has been clear from a comparison of the living plants in Mr. Bowles's garden where the plant from Crete (collected by Mr. H. C. Baker) and that from Rhodes (collected by Mr. Ogilvie Grant) grow within a few yards of one another. The latter is, at present, a smaller plant, but there is no significant difference of character. This species is described below as *C. macrophyllum* B. L. Burtt.

Colchicum bowlesianum *B. L. Burtt*, sp. nov., *C. sibthorpii* Baker affinis sed foliis suberectis haud undulatis, floribus majoribus saturatius coloratis, perianthii segmentis obtusioribus, antheris aequilongis sed angustioribus distinguendum.

Folia hysteranthia, circiter 9, late linearia ; lamina 20–25 cm. longa et 3 cm. usque lata, apice obtusa, suberecta, margine haud undulata, saturate viridis. *Flores* autumnales. *Perianthii tubus* pallidus, parte supra terram circiter 15 cm. longa, cylindricus; *segmenta* oblongo-obovata, 4·5–5·5 cm. longa, 1·5–2 cm. lata, apice rotundata, pulchre purpureo-tessellata, basin versus pallidiora, medio ad basin leviter sulcata et circa sulcum papillosa. *Stamina* leviter inaequalia ; filamenta alba basi leviter incrassata et aurantiaca, ad apicem attenuata, 2–3 cm. longa ; antherae 11 mm. longae et 2·5 mm. latae, sordide purpureae, polline luteo praeditae. *Styli* antheras aequantes, apice valde unilateraliter incrassati et subhamati, unilateraliter stigmatosi. *Fructus* ovoideus, circiter 2 cm. longus.

GREECE. Corms collected in neighbourhood of Salonika, cult. *E. A. Bowles* (type). Corms collected near the monastery of Hagios Dionoysis, Mt. Olympus, cult. in hort. bot. reg., Kew, 1890 (type of Bot. Mag. t. 7181).

Colchicum macrophyllum *B. L. Burtt* sp. nov. inter species floribus tessellatis praeditas foliis permagnis plicatis, floribus infundibuliformibus tubo triquetro segmentis ex albo pallidissime lilacinis leviter et irregulariter tessellatis, stigmatibus curvatis sed vix incrassatis, polline viridi

facile distinguitur. Ad *C. cilicicum* Dammer ob folia plicata accedit sed ab hac specie floribus tessellatis paucis stigmatibus valde unilateralibus falcatis longe distat.

Cormus 5–6 cm. diametro, tunica brunnea in collum robustum producta. *Folia* hysteranthia, saepissime 4, magna, valde plicata, circiter 35 cm. longa et 14 cm. lata, laete viridia vel luteo-viridia, ovata vel elliptico-ovata, acuta vel acuminata, margine haud undulata. *Perianthii tubus* valde triquetrus, supra terram circiter 5 cm. productus ; limbus infundibuliformis ; segmenta oblongo-elliptica, 4·5 cm. longa 2·2 cm. lata, ex albo pallidissime lilacino-tessellata, intus ad basin sulcatus. *Stamina* alternatim leviter inaequalia ; filamenta alba 2 cm. longa, basi leviter incrassata et aurantiaca, subulata ad apicem attenuata ; antherae dorsifixae, 8–10 mm. longae, purpureae, connectivo pallidiore, polline viridi. *Styli* antheras aequantes, apices versus leviter curvati, vix incrassati, albi purpureo-suffusi, unilateraliter stigmatosi. *Fructus* circiter 5 cm. longus, utrinque acutus.

CRETE. Sine loc., coll. *H. C. Baker*, cult. *E. A. Bowles* (type). Sphakia, *Sieber* (sub *C. variegato*). Vamos, prope Retymo, fallow fields of terra-rossa, flowers tesselated, September 1938, *Barneby & Davis*. Ad Prosnero, distr. Sphakia, in saxosis, Oct. 1899, *Kalaidis* (*Baldacci*, Iter Creticum Alterum—in herb. mus. brit.!)

RHODES. Sine loc., coll. & cult. *M. Ogilvie Grant* (etiam in hort. *E. A. Bowles* culta). Mount of Prophet Ilias, Oct. 1948, *Goulimy* 12.

An Earlier Name for Omphalia flavida Maubl. and Rangel

Examination of the type of *Agaricus citricolor* Berk. & Curt., 1868, viz. Wright 15 from Cuba, shows it to be the fungus well known to plant pathologists as *Omphalia flavida* Maubl. & Rangel 1914. The characteristic gemmifers, *Stilbum flavidum* Cooke, are present on Wright's material. This species is evidently common on native shrubs and herbs in West Indian rain forests well away from plantations as is shown by the following collections :

JAMAICA : on creeping herb in elfin woodland, west slope of High Peak, Blue Mountains, 22.XII.1949, *Dennis* J 43.

TRINIDAD : on unidentified fallen leaves in lower montane forest, 1800 ft., north of Arima, 25.IX.1949, *Dennis* 69.

The fungus is evidently a *Mycena* in the sense of Kühner and of A. H. Smith and should be known as *Mycena citricolor* (Berk. & Curt.) Sacc.

R. W. G. DENNIS.

PITHOCARPA LINDL.

P. LEWIS AND V. S. SUMMERHAYES.

The small Australian Composite genus *Pithocarpa* was first proposed by Lindley in 1839 in his classic paper on " The Vegetation of the Swan River Colony " (now Western Australia) which was published as an appendix to the Botanical Register*. Lindley considered it to be allied to *Humea* in floral structure, but pointed out the marked difference in habit. He recognised two species, *P. pulchella*, which, in view of its being mentioned first, and its much longer description, should be considered as the type species, and *P. corymbulosa*, which is indicated as differing by the corymbose inflorescences, the almost wholly involucre and the scarious outer involucral bracts. In neither case is any locality mentioned, nor is there any information accompanying the type specimens, but in view of the small area of the Colony known at that time, the species were almost certainly not collected far from Perth.

The next treatment of the genus was by Steetz in Lehmann's account of the Western Australian plants collected by Preiss.† Steetz enumerated two species, one which he identified with Lindley's *P. corymbulosa* and, secondly, a new one, *P. major*. *P. pulchella* Lindl., which was not among Preisses collections, he considered to be near *P. corymbulosa*, but it seems evident from his description that the plant he named *P. pulchella* was different from Lindley's original plant. It is also clear that he had not seen the true *P. corymbulosa*, since none of his descriptions fits that species. In fact none of the plants mentioned by him is correctly named! His *P. major* is evidently identical with *P. pulchella* Lindl., while the plants he referred to *P. corymbulosa* and *P. pulchella* are two distinct species described later in this paper.

In Flora Australiensis§ Bentham introduced a new source of confusion by recognising only one species which he called *P. corymbulosa* Lindl. He states that the species " varies much in the size of the flower heads " but that he could " find no other difference " and that " the intermediate sizes are numerous ". On the contrary we find that the sizes of the flower heads in several of the species are sharply defined and that intermediate sizes are comparatively uncommon. In his treatment of the genus as monotypic Bentham was followed by Gardner‡ in his enumeration of the flora of Western Australia.

When attempting to name several specimens, referable to this genus, in a collection made by Mr. J. Souster, we were struck by the great differences between many of the other specimens in the Kew herbarium. A careful examination, including dissections of all the gatherings, showed that far from being monotypic, the genus, as known to us at present, consists of four clearly defined species of which two have been previously unnamed. The species also have distinct geographical distributions, so far as our records show, three of the species occurring in the Perth region, broadly speaking, whereas the fourth is restricted to the regions surround-

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*Edwards, Bot. Reg., App. Vols. **1–23**, p. xxiii (1839).

†Lehmann, Plantae Preissianae, **1,** 445-6 (1845).

§Flora Australiensis, **3,** 590 (1866).

‡Enum. Plant. Austral. Occid. 134 (1931).

ing Albany. A good deal more exploration, however, is necessary to enable us to obtain a clear idea of the distributions of the several species. It therefore seems worth while to present the results of our investigations in a formal manner, including a key for identifying the species, descriptions of the two new species, and an enumeration of the specimens seen by us.

Pithocarpa Lindl.

Annual herbs up to 2 feet in height, often somewhat woody at the base, with erect or ascending much branched stems. *Leaves* alternate, mostly borne on the lower part of the stem, linear to narrowly oblanceolate, the lower ones up to 3 cm. in length, the upper gradually smaller and indistinguishable from the lower inflorescence bracts, the stems and lower surfaces of the leaves more or less woolly. *Capitula* either single on lateral branches or in small corymbs of 2–9 capitula, these corymbs sometimes aggregated to form larger corymbose panicles. *Capitula* homogamous, not truly radiate, 3–15 mm. in diameter. *Involucre* turbinate or obconical, consisting of numerous (30–90) bracts, the outer ones short and adpressed, the inner much longer, with more or less coloured radiating laminae, all (especially the outer ones) with woolly hairs outside. *Receptacle* flat, without scales. *Florets* 15–65, all hermaphrodite, tubular, 5-toothed at the apex. *Anthers* with fine tails at the bases of the thecae. *Style* branches divaricate, ± recurved, truncate and often shortly penicillate at the apex. *Ovary* glabrous or papillose, pappus absent. *Achenes* angular.

Four species, all natives of Western Australia.

Type species : *P. pulchella* Lindl.

KEY TO SPECIES.

Involucral bracts without dark pigment, up to 45 in number ; ovary glabrous; receptacle 1·5–2 mm. long ; capitula 3–5 mm. in diameter, in well-marked corymbs containing up to 9 capitula, the lower corymbs borne on long incurved peduncles up to 13 cm. in length ; flowers 15–20 per capitulum ; corolla 2–2·5 mm. long ; lower leaves over 3·5 mm. wide . . . . 1 *corymbulosa*

Involucral bracts with dark pigment, usually over 45 in number ; ovary variously papillose ; receptacle over 2 mm. long ; capitula usually more than 5 mm. in diameter ; corymbs not very distinct, only rarely containing 4–5 capitula, capitula sometimes solitary on long peduncles ; flowers over 20 per capitulum ; lower leaves less than 2 mm. wide :

  Stigma with darkly pigmented papillae along outer surface and tips ; involucral bracts tipped with very dark brown, 35–70 in number, middle bracts with slightly flexuous margins ; stems much branching just above the base, slender, ascending, rather flexuous 3 *melanostigma*

  Stigma without darkly pigmented papillae ; involucral bracts tipped with medium to dark brown, over 60 in number, margins of middle bracts not flexuous ; stems erect, rather stiff :

    Capitula 4–8 mm. in diameter, usually in small corymbs of 2–5 capitula, but sometimes solitary ; involucral bracts 60–75, largest 4·5–6 mm. in length ; receptacle 2·25–2·5 mm. long ; flowers 20–25 per capitulum ; corolla 1·5–2 mm. long 2 *achilleoides*

Capitula 10–15 mm. in diameter, mostly solitary on long peduncles, but sometimes forming small corymbs of up to 4 capitula ; involucral bracts 75—100, largest 7·5–10 mm. in length ; receptacle 3–4·5 mm. long ; flowers 40–65 per capitulum ; corolla 2·5–3 mm. long . . . . 4 *pulchella*

Enumeration of Species.

1. **Pithocarpa corymbulosa** *Lindl.* in Edwards, Bot. Reg. App. vols. **1–23,** p. xxiii (1839) ; ? Gardner, Enum. Pl. Austral. Occid. 134 (1931), partim.

WESTERN AUSTRALIA. "Swan River", *Toward* (type in Herb. Cantab.) ; Greenmount, Darling Range, 19 Feb. 1898, *Morrison* 8232 ; Lesmurdie Falls, on Yule Brook, S.W. of Kalamunda, dry stony hillside, plants drying off when found, apparently annuals, 1–2 ft., 19 Jan. 1947, *Souster* 623 ; no locality or date, *Morrison.*

P. corymbulosa appears on general grounds to be the most primitive member of the genus. The capitula are smaller than in any other species and are aggregated into small groups which together form flat-topped corymbs somewhat reminiscent of an *Achillea.* In addition the involucral bracts show the least amount of differentiation from one another in shape or size. Apart from the inflorescence characters the species may be recognised by the comparatively broad lower leaves which are usually over 3·5 mm. in width.

This is the only species in which we have seen any developed achenes. Those seen appear to be still immature and are obtusely angular and quite glabrous like the ovaries. The ovaries in the other species are papillose but no achenes have been seen.

For some unexplained reason the name has been adopted by various authors to include all the species of the genus known to them and this has given a false impression of its frequency. Actually the species appears to be very local in distribution and this may account for it not having been re-collected for many years after Mr. Toward first gathered it. All the known localities are on the escarpment of the plateau, generally known as the Darling Range.

2. **P. achilleoides** *P. Lewis & Summerh.*, sp. nov. ; a *P. corymbulosa* Lindl. foliis inferioribus angustioribus, capitulis minus aggregatis, bracteis involucratis plus numerosis exterioribus apice acutioribus coloratis, a *P. pulchella* Lindl. capitulis minoribus magis aggregatis, bracteis involucratis minus numerosis minoribus, floribus per capitulum 20–25, corolla breviore satis differt.

[*P. corymbulosa* (non Lindl.) Steetz in Lehm. Pl. Preiss. **1** ; 445 (1845) ; Benth. Fl. Austral. **3,** 590 (1866), partim; Gardner, Enum. Pl. Austral. Occid. 134 (1931), partim.].

Herba verosimiliter annua, erecta, saepius 30–45 cm. alta, e basi multiramosa. *Caules* basi sublignosi, rigidi, teretes, usque ad 3 mm. diametro sed saepius angustiores, inferne foliati, superne subnudi in inflorescentias transeuntes, lana tenui ± adpressa omnino obtecti. *Folia* sessilia vel subsessilia, linearia ad anguste oblanceolata, inferiora 13–20 mm. longa, 0·75–1·75 mm. lata, superiora sensim decrescentia, in bracteas inflorescentiae abeuntia, marginibus ± recurvatis, supra leviter

asperula et sparse adpresse lanata, subtus dense lanata. *Capitula* ad apices ramorum suberectorum vel sub-patentium rarius solitaria vel saepius 2–5-aggregata, pedunculata, 4–8 mm. diametro, 20–25-flora ; receptaculum 2·25–2·5 mm. longum. *Involucrum* turbinatum ; bracteae pluriseriatae, 60–75, infimae minimae, lanceolatae, acuminatae, inferiores sensim longiores, lineari-lanceolatae, mediocres e basi angusta oblanceolatae, omniae superne brunneo-coloratae extra inferne breviter lanatae, superiores e basi angusta spathulato-lanceolatae, acutae, albae, superne radiatae, 4·75–6 mm. longae, superne 1–1·75 mm. latae, supremae (interiores) quam superiores breviores et multo angustiores, ±anguste spathulatae. *Corolla* tubulosa, lobis brevibus acutis papillosis, 1·5–2 mm. longa, praesertim inferne papillis brevibus sparse instructa, ceterum glabra. *Antherarum* thecae 0·75–1 mm. longae, basi in caudam tenuem productae, connectiva apice supra thecas breviter producta, filamentis 0·5–0·75 mm. longis, *Stylus* in toto 1–1·75 mm. longus ; stigmata apice papillato-penicillata, extra breviter papillosa ; ovarium cylindrico-ellipsoideum, breviter denseque papillosum, 0·5 mm. longum. *Achaenia* matura non visa.

WESTERN AUSTRALIA. Swan River, in stony sandy places on higher ground, 22 Mar. 1839, *Preiss* 137 * ; Swan River, 1844, *Drummond* 169 ; Wooroloo, Nov. 1907, *Koch* 1895 (type).

It is evident that Bentham looked upon the material of this species as being merely small-flowered specimens of his " *P. corymbulosa* ". Detailed examination, however, shows that it differs from *P. pulchella* in numerous floral details apart from the size of the flower heads. In general organisation the species is clearly intermediate between *P. corymbulosa* proper, on the one hand, and *P. pulchella* on the other. The important distinctions are indicated in the diagnosis. From *P. melanostigma* Lewis & Summerh. it differs in the greater aggregation of the flower heads, the paler tips to the involucral bracts and the non-pigmented stigmatic arms, as well as in other minor features.

P. achilleoides is known with certainty only from the upper regions of the plateau inland from Perth. The specific epithet is given on account of the resemblance of the inflorescence to certain species of *Achillea.*

3. **P. melanostigma** *P. Lewis & Summerh.*, sp. nov. ; a *P. achilleoide* P. Lewis & Summerh., capitulis saepius solitariis, bracteis exterioribus apice pallidiore coloratis ; a *P. pulchella* Lindl. capitulis dimidio minoribus, floribus paucioribus ; ab utraque habitu minus erecta, stigmatibus nigro-papillatis distincta.

[*P. pulchella* (non Lindl.) Steetz in Lehm. Pl. Preiss. **1,** 446 (1845), in adnot.].

[*P. corymbulosa* (non. Lindl.) Benth. Fl. Austral. **3,** 590 (1866), partim ; Diels et Pritz. in Engl. Bot. Jahrb. **35,** 634 (1905) ; Gardner, Enum. Pl. Austral. Occid. 134 (1931), partim].

Herba verosimiliter annua, usque ad 45 cm. alta, e basi multiramosa. *Caules* basi sublignosi, saepius ± adscendentes, graciles, subflexuosi, teretes, usque ad 2 mm. diametro sed saepius multo tenuiores, inferne foliati, superne subnudi in inflorescentias transeuntes, primo lana tenui

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*This appears to be the same gathering as that referred incorrectly to *P. corymbulosa* Lindl. by Steetz, but cited by him as No. 27. The description agrees and so do the other details of collection.

adpresso obtecti, demum ± glabrescentes. *Folia* sessilia, linearia ad anguste oblanceolata, apice acuta, basi ± angustata, 13–24 mm. longa, 1–2 mm. lata, superiora sensim decrescentia in bracteas inflorescentiae abeuntia, marginibus leviter revolutis, supra glabrata vel tenuiter lanata, subtus ± dense lanata. *Capitula* ad apices ramorum vel ramulorum suberectorum solitaria, inflorescentias laxe corymbosas formantia, 5–8 mm. diametro, 20-35-flora ; receptaculum 2–2·5 mm. longum. *Involucrum* turbinatum ; bracteae pluriseriatae, 35–70, infimae minimae, oblongo-lanceolatae, acutae, inferiores longiores, lanceolatae vel rarius oblanceolatae, mediocres oblanceolatae, marginibus leviter flexuosis, omniae superne rubro-brunneo-coloratae extra inferne breviter lanatae, superiores e basi angusta oblanceolatae, acutae, albae, superne radiatae, 5·75-6 mm. longae, superne 1·25–1·5 mm. latae, interdum marginibus leviter flexuosis, supremae (interiores) quam superiores breviores et angustiores, sed textura similes, subspathulato-oblanceolatae. *Corolla* tubulosa, lobis breviter acutis maturate ± recurvatis papillosis, circiter 2 mm. longa, inferne papillis brevibus sparse instructa vel glabra. *Antherarum* thecae circiter 1 mm. longae, basi in caudam acuminatam productae, connectiva apice supra thecas breviter producta, filamentis circiter 0·75 mm. longis. *Stylus* in toto 1·5–2·25 mm. longus ; stigmata extra dense nigro-papillosa ; ovarium cylindrico-ellipsoideum, dense papillosum, 0·5-1 mm. longum. *Achaenia* matura non visa.

Western Australia. King George's Sound : in rocky hills, Dec. 1801, *R. Brown* 2260 ; no locality [probably at head of Kalgan and Hay rivers, 1835], *Roe* (Vienna herbarium, not seen) ; King George's Sound, Jan., Feb. 1854, *Harvey* ; Mt. Clarence, King George's Sound, *Oldfield* ; District South West Plantagenet, in scrub on damp hills not far from the sea, Jan. 1901, *Pritzel* 243 (type) ; Mt. Clarence, Albany, 120 m., yellow stony loam derived from underlying granite, spreading wiry herb 6 ins. high, rays white, some reddish brown on dorsal surface, 16 Apr. 1947, *Souster* 665.

This is rather like a small edition of *P. pulchella* in many respects, especially as regards the nature and arrangement of the capitula. It differs from all the other species, however, in the less erect growth, the main stem branching at the base into a number of rather slender ascending laterals. Floristically the species may be distinguished by the dark-coloured papillae on the outside of the stigmatic branches, the specific epithet being derived from this feature.

P. melanostigma is apparently quite isolated geographically from the rest of the genus, being restricted to an area in the vicinity of King George's Sound. The nearest known locality for any other species is Pinjarra, from which *P. pulchella* has been recorded. It remains to be seen if this isolation is confirmed when the intervening country has been more thoroughly explored botanically.

4. **P. pulchella** *Lindl.* in Edwards, Bot. Reg. App. vols. **1–23,** p. xxiii (1839).

P. major Steetz in Lehm. Pl. Preiss. **1,** 446 (1845).

[*P. corymbulosa* (non Lindl.) Benth. Fl. Austral. **3,** 590 (1866), partim ; Gardner, Enum. Pl. Austral. Occid. 134 (1931), partim].

Western Australia. Moore River, *Oldfield* ; wooded plains above Guildford, in somewhat calcaerous gravelly soil, 9 Aug. 1839, *Preiss*, s.n.

(not seen) ; Greenmount, at foot of Darling Range, in gravelly soil, 24 Apr. 1901, *Andrews* 446 ; Bayswater, Lower Swan River, 14 Apr. 1899, *Morrison* 9227 ; Perth, N.E. of Highgate Hill, 1 June 1897, *Morrison* 7195 ; " Swan River ", 1839, *Drummond* (type in Herb. Cantab.) ; " Swan River ", *Drummond* 353 ; Buckland Hill, near Perth, on rocky limestone hills, 4 Jun. 1902, *Andrews* 447 ; Pinjarrah, Murray River, *Mueller.*

P. pulchella can be easily recognised on account of the large capitula, which may be so much as 15 mm. in diameter. Corresponding with this we find a greater number of bracts and of flowers than in any other species.

The species appears to be restricted to the coastal plain between the sea and the Darling Range escarpment. It is known from the Moore River in the north to Pinjarra in the south, but its true distribution may be more extensive. From the evidence available it appears likely that Preiss accompanied Drummond on the occasion when the latter collected the type specimen. It is therefore probable that the wooded plains above Guildford, mentioned on Preiss' label, are the type locality of *P. pulchella.*

Plant Hunting in Europe*—Lovers of alpine plants will read this little book with great interest and many will agree that as suggested in the foreword, Dr. Roger-Smith is undoubtedly the right man to act as our guide over the mountains and countries described. After giving details of how to collect and preserve the plants after collection the author proceeds to give an account of the various countries in Europe to which he has paid visits, with the names of the many interesting and beautiful plants to be found there. Switzerland, the Pyrenees, the Dolomites and Karawanken, Czechoslovakia, Yugoslavia, Greece and Cyprus are dealt with in turn and whether in the " Valley of Flowers " where the peculiar parasite *Lathraea clandestina* with its purple flowers grows so profusely, or among the ruins of Tyrens where the " dainty " *Iris Sisyrinchium* flourishes, our imagination is thrilled and our attention held by the delightful account of the happy hunting grounds of the alpine plant lover. After reading it one feels that the book is all too short, but as the author says his " personal experiences of plant-hunting do not pretend to be anything like a complete record of the plants of Europe ". Nevertheless it will appeal to all those who appreciate the delights—and difficulties—of the plant hunter. One might mention that it is desirable for all books to bear the date of publication but unfortunately this book although recently received is undated.

H. S. Marshall.

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*Plant Hunting in Europe. By H. Roger-Smith. Pp. 80 + 16 pls. (Alpine Garden Society). Bedford : Rush & Warwick (Bedford) Ltd. n.d. Price 5/-.

THE RUSTAM HERBARIUM, 'IRAQ. PART IV.

(Systematic List (continued).*

BY R. A. BLAKELOCK.

PLANTAGINACEAE.

Plantago albicans *L.*

Jabal Hamrin (nr. Injana), on light gypsiferous soil, 12.4.33, *Guest, Eig and Zohary* 5086.

The flowers of this specimen are somewhat smaller than is usual in this species, and the roots appear to be annual. In these characters it is matched by Mrs. V. Dickinson's material from Arabia and Lt. Col. Graham's specimen from Shargat, 'Iraq. Some Egyptian material in the Kew Herbarium is intermediate between these and the typical form.

P. boissieri Hausskn. et Bornm. is considered by Zohary to be a form of this species (l.c. infra 226).

P. bellardi *All.*

Nr. Kirkuk, 300 m., on the road to Baba Gurgur oil wells on loose sandy soil, 4.4.31, 1366 ; Jabal Darawishka (nr. Khanaqin), 210 m., 28.3.32, 1789 ; Kani Dolman hills, Kirkuk, 390 m., on dry stony rounded hill-top, 30.4.33, 4311 ; Baba Gurgur (nr. Kirkuk), 315 m., on light red soil by sandstone outcrop, 16.4.33, *Guest, Eig and Zohary* 5105.

P. coronopus *L.*

Jabal Hamrin, 150 m., on sandy calcareous soil among rocks, 6.4.31, 1424 ; Diwaniya (Hor-ad-dukn), on irrigated land, fodder plant, eaten by sheep, camels and water-buffaloes, native name 'anaik', 14.4.32, *Sirkal Mhd. Ali* 2370 ; Daltawa, in cultivated fields and on the dry edges of marshy patches or "jawarib" or "hor" land (i.e. low-lying land liable to flooding), native name 'anaij', 26.5.32, 2443 ; do., one of the best grazing plants for sheep, 29.4.32, 2443 A ; Baghdad, in fields at Rustam, 25.4.33, *Yussef Lazar* 3912.

P. cretica *L.*

Ain Sifni (Mosul Liwa), 450 m., on fallow land, good fodder plant, native name kia'ai hor (K.), 9.6.32, *Salim Effendi* 2561.

P. lagopus *L.*

Rustam Farm, nr. Baghdad, Apr. 33, *Yussef Lazar* 35b ; Kut, Sept. 29, 200 ; Kifri, along edge of millstream, Mar. 30, 375 ; Sumaicha (nr. Samarra), Feb. 30, 387 ; Rustam, foot of Jabal Hamrin, 21.3.30, 508 ; Mandali, cultivated fields, May 30, 882 ; nr. Felluja, cultivated land, native name adhain-as-sakhait, 6.3.30, 963 ; Rustam, 19.3.32, *Yussef Lazar* 1140A ; Dohuk, 350 m., in cultivated fields, 1.4.31, 1298 ; Qizil Robat, at edge of a cornfield, eaten by sheep, native name zebad, 28.3.32, 1767 ; Daltawa, in cultivated fields, eaten by sheep, 29.4.32, *Darwish Hadari* 2634.

P. lanceolata *L.*

Kirkuk, on banks of a millstream, 22.3.30, 537 ; Rustam, in barley fields, 19.3.32, *Yussef Lazar* 1140 ; Mandali, in a cornfield, native names zibad or idhan-as-sakhailah (=" goat's ears "), 26.3.32, 1807 ; Tanjero Valley (Sulaimaniya), on " daim " and watered land throughout the

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*Continued from Kew Bull. **1948,** 375-444 (1948); **1949,** 41-65 (1949); **1949,** 517-553 (1949) province, spring and summer plant eaten by all animals, used for making poultices for humans, native name rikesha, 18.4.32, *Gowan* 2424; Daltawa, in a cornfield, native names zibad or adhan-as-sakhailah, 26.3.32, 2463 ; Hilla, on daim (unirrigated) land generally but this specimen was from an irrigated field, eaten by most animals, native name zibad, 28.5.32, *Civil Vet. Surgeon of Hilla* 2517 ; Rowanduz Gorge, 440 m., among stones by a waterfall pool, 17.7.32, 3017 ; Seri Hassan Beg, 1800 m., at the edge of a cornfield, 24.7.32, 3023 ; Rustam, in a channel, native name zowait, 7.5.32, *Yussef Lazar* 3426 ; Baghdad, on channels in the orchard, native names zibad or zowait, 5.4.33, *Yussef Lazar* 3911.

P. loeflingii *L.*

Shargat (on ancient mound at Ashur), Mar. 30, 399 ; Latifiya Estate (nr. Mahmudiya), very common in linseed fields (on light sandy soil) on land cropped for first time which had been barren desert for many years before (cf. adjoining unirrigated land), seed must have been brought down by irrigation water, 23.3.32, 1681 ; Qizil Robat, in a cornfield, native name zibad, eaten by sheep, 28.3.32, 1765.

P. major *L.*

Daltawa, in a ditch in the shade of a date garden, used for application to boils, native name bizr dinbil (=" boil seed "), 26.5.32, 2455 ; Zawita, Kurdistan, 900 m., in ditches in gardens used for treating boils, 27.7.33, 3753.

P. notata *Lag.*

Shargat (on ancient mound at Ashur), Mar. 30, 399A ; Salman Pak (nr. Ctesiphon), on unirrigated pasture land, grazed by sheep and other animals, native name zibad, 4.3.32, *Su'ud al Dhahir* 1947.

Zohary considers *P. haussknechtii* Vatke and *P. phaeopsis* Payne to be synonyms of *P. notata* in " On the *Plantago* Species of the Near East " in Pal. Journ. Bot. J. Ser. **1,** 227 (1938). Bornmüller took the same view in Verh. zoo.-bot. Ges. Wien. **48,** 625 (1898).

P. ovata *Forsk.*

Shargat (on ancient mound at Ashur), Mar. 30, 399 ; Jabal Hamrin nr. Injana, 29.3.30, 692 ; Jabal Hamrin, loose sandy calcareous soil pockets among rocks at Injana, 150 m., 6.4.31, 1426 ; Jabal Darawishka, 210 m., on stony land, eaten by sheep, native name zibad, 29.3.32, 1845 ; Zubair (Basra), in sandy desert on the 'Iraq–Nejd frontier, spring fodder plant, native name riblah, 4.5.32, *Abdul Wahab Mustafa* 3162 ; Jazira Desert, 20.4.33, *Edmonds* 3815 ; Southern Desert, W. of Zubair, on compact sandy soil, covered by small stones and grit, 8.4.33, *Guest, Eig and Zohary* 5039.

P. psyllium *L.*

Dohuk, 450 m., in cultivated fields, 1.4.31, 1304 ; nr. Kirkuk, 300 m., on the road to Baba Gurgur oil wells (sandy soil), 4.4.31, 1362 ; Tursak, Mandali, native name zibad, 26.3.32, 1738 ; Dohuk, native name gia barakh (K.), 2.6.32, *Mekki Beg* 3263 ; Balad Sinjar, 429 m., on roadside grazing strip, 28.4.33, 4102 ; Balad Sinjar–Tal Afar, 330 m., 28.4.33, 4153 ; Ain-al-Husan (nr. Sinjar), 315 m., on open *Poa* steppe, 28.4.33, 4234 ; Kani Dolman hills, Kirkuk, 390 m., on dry stony rocky hill-top, 30.4.33, 4312.

P. saxatilis *MB.*

Chia-i-Mandali, 2700 m., on the rocky mountain side, 19.7.32, 2711 ;

Arl Gird Dagh, 3000 m., by a melting snowdrift, 21.7.32, 2835; do., 3000–3600 m., on the rocky mountain side, 22.7.32, 2856.

Plantago sp.

Nr. Felluja, on haswah land, 6.3.30, 958.

Material too young for more accurate determination.

Since Boissier's key (Fl. Or. **4,** 877 878 (1875)) is somewhat confusing, and Zohary in " On the Plantago Species of the Near East " in Pal. Journ. Bot. J. Ser. **1,** 227 (1938), gives neither key nor descriptions, a field key to the species of *Plantago* found in 'Iraq is given here.

A. Leaves radical, plant rarely shortly caulescent and then leaves alternate
B. Leaves ovate, glabrous to pubescent. Perennial . . *major* L.
BB. Leaves generally lanceolate to linear (if ovate then long and densely pilose). Perennial or annual
C. Bracts ± as long as calyx. Spike and leaves various
D. Bracts acuminate or acute
E. Bracts glabrous. Generally perennial . . *lanceolata* L.
EE. Bracts long pilose or lanate. Annual
F. Leaves and peduncles glabrescent or sparsely pilose, leaves dentate generally shorter than scape, peduncles not recurved in fruit . . . . *lagopus* L.
FF. Leaves and peduncles with dense spreading hairs or lanate, leaves entire generally longer than scape, peduncles recurved in fruit
G. Corolla lobes lanceolate: spike ovate or oblong, villose . . . . *bellardi* All.
GG. Corolla lobes ovate; spike globose, lanate *cretica* L.
DD. Bracts obtuse or rounded
H. Bracts glabrous or glabrescent
I. Corolla lobes ovate, c. 2 mm. long . . . *ovata* Forsk
II. Corolla lobes lanceolate, c. 1 mm. long *loeflingii* L.
HH. Bracts densely hairy or long pilose on margins
J. Corolla lobes ovate, leaves entire or not. Annuals or perennials
K. Corolla lobes obtuse, bracts lanate, leaves with few narrow outgrowths, rarely pinnatifid. Annual *notata* Lag., (*hausskneckhtii* Vatke, *phaeopsis* Payne)
KK. Corolla lobes acute or acuminate, bracts shortly pilose or glabrescent on back, margins pilose, leaves entire or dentate or with outgrowths. Perennials (sometimes annual in *P. albicans* ?)
L. Leaves adpressed pilose to glabrescent, spike ovate to oblong-cylindric dense. Alpine plant *saxatilis* M.B.
LL. Leaves densely sericeo-lanate, spike linear to cylindric often subinterrupted at base. Lowland plant . . . . *albicans* L. (*boissieri* Haussk. et Bornm.)

JJ. Corolla lobes lanceolate, leaves entire. Annuals
M. Corolla glabrous, leaves linear-lanceolate to lanceolate *cylindrica* Forsk.
MM. Corolla lobes with conspicuous hair on the back, leaves spathulate-ovate to spathulate-lanceolate *ciliata* Desf.
CC. Bracts shorter than calyx, acute or acuminate, linear spike up to 4 mm. wide, leaves generally pinnatifid . . *coronopus* L.
AA. Leaves cauline, opposite . . . . *psyllium* L.

The following subspecies and varieties are listed by Zohary (l.c.)—

P. cylindrica subsp. *mesopotamica* Zohary p. 225.

P. cylindrica var. *micropodiodes* Zohary p. 226.

P. ovata Forsk. var. *decumbens* (Forsk.) Zohary p. 227.

P. coronopus L. var. *crassipes* Coss. et Dav. in Bull. Soc. Bot. France, **36,** 106 (1889).

Boissier (Fl. Or. **4,** 881) records *P. lanceolata* var. *eriophylla* Decne. from Kurdistan.

Nábělek in Publ. Fac. Sci. Univ. Masar. **105,** 6 (1929) described as new *P. thrichophylla* from S.W. Persia very near the 'Iraq border. No specimens of this have been seen ; from the description and figure it is possibly a depauperate form of *P. ovata.*

NYCTAGINACEAE.

Bougainvillea spectabilis *Willd.*

Gardens at Basra, Oct. 29, 285.

ILLECEBRACEAE.

Herniaria hemistemon *J. Gay.*

Chuwaiba Wells, nr. Zubair, on sandy soil in slight depression, 8.4.33, *Guest, Eig, & Zohary* 5047.

H. hirsuta *L.*

Nr. Mahmudiya (Latifiya Estate), native name shuwail, 16.5.31, 2390 ; Baghdad, in field at Rustam, native name shuwail, 25.4.33, *Yussef Lazar* 3890 ; Ain Ghazal (Mosul Province), 360 m., in a field, 28.4.33, 4075A.

Paronychia arabica (*L.*) *DC.*

Zubair, on somewhat compact sandy soil near cultivated area of " sulbiyah " (i.e. *Tamarix* groves, interplanted with other crops when young and irrigated by wells—in desert), 8.4.33, *Guest, Eig and Zohary* 5014.

P. kurdica *Boiss.*

Khanaqin, 210 m. on bare ledges of rock, tufted plant forming a low flat mat on the rock face, 29.3.32, 1834 ; Tauq Chai, 210 m., in the dry stony torrent bed, 16.4.32, 1975 ; nr. Shaikh Adi (N. of Mosul), 750 m., on rocks, 14.7.33, 3660 ; Amadia, Kurdistan, c. 1500 m., on rocks in Mazurka Gorge, 3780 ; Kani Dolman hills, Kirkuk, 390 m., on dry stony rounded hill-top, 30.4.33, 4359.

Pteranthus dichotomus *Forsk.* (*P. echinatus* Desf.).

Jabal Hamrin, 29.3.30, 671, 680 ; do. (nr. Injana), 150 m., 6.3.31, 1422 ; Baba Gurgur, nr. Kirkuk, 315 m., on light red soil outcrop, 16.4.33, *Guest, Eig and Zohary* 5107.

AMARANTHACEAE.

Amaranthus angustifolius *L.* subsp. **graecizans** (*L.*) *Thell.* in A. & G. Syn. **5,** 307 (1914) det. N. Y. Sandwith.

Rustam, July 29, 168 ; Nasiriya, in irrigated fields and gardens, eaten by all animals, native name sarmaq, 18.4.32, *Abd-ar-rizaq Barbuti* 2538 ; Aziziya, in a *Sorghum* field, on channels, cooked and eaten as a vegetable by the peasants, native name sarmaq, 17.7.32, 3475 ; Hit, in a date garden, native name urf-ad-dik, 15.10.32, 3528.

A. gracilis *Desf.* det. N. Y. Sandwith.

Hit, in a date garden, 14.10.32, 3527.

A. retroflexus *L.* det. N.Y.S.

Dabouni, Sept, 29, 218 ; Rowanduz Gorge, 600 m., on the stony hillside, 25.7.32, 2981 ; Baghdad (Harathiya Estate), by a saline seepage pool near a canal, native name lizaij (?), 14.7.32, 3237 ; Zawita, 900 m., gardens, native name bunsorg (K.), 27.7.33, 3746.

Amaranthus is dealt with by Thellung in Ascherson and Graebner Syn. Mitteleur. Fl. **5,** 225-354 (1914).

CHENOPODIACEAE.

Atriplex leucolada *Boiss.* subsp. **turcomanica** (*Moq.*) *Aellen* in Engl. Bot. Jahrb. **70,** 23 (1939).

In the Jazira (Wadi Tharthar), at the edge of a sulphurous spring, forming a small bush, native name rughul, 15.10.32, 3520; Aziziya, in a *Sorghum* field, bushy plant with woody stems, 6.10.32, 3570.

Aellen (l.c. 1-66) gives a revision of the Oriental species of *Atriplex*.

A. nummularium *Lindl.*

Rustam (alien), cultivated as a fodder plant for introduction originally from Australia, 20.2.32, 3313, 3314.

A. tartarica *L.* ?

Hilla, on daim (unirrigated) land, grazed by sheep, cattle, camels and horses, native name rughul, 28.5.32, *Civ. Vet. Surgeon of Hilla* 2012 ; Daltawa, eaten by all animals, also used as a remedy for " khuzaibrah " poisoning, native name rughul or hamadh, 26.5.32, 2450 ; Baghdad, in fields at Rustam, native name rughul-al-barriya, 25.1.33, *Yussef Lazar* 3905.

These specimens bear no fruit.

Bassia eriophora (*Schrad.*) *Aschers.*

S. of Mandali -Kabal Tahlao Nukta, 10.5.30, 788 ; Babylon, among the ruins in depressions, native name alaich-al-ghazal, 23.3.32, 1682 ; Baghdad, in depressions at Rustam, native name qutainah, 21.5.33, *Yussef Lazar* 3926.

B. hyssopifolia (*Pall.*) *Kuntze.*

Diwaniya, in a thicket near the river, native name suād or arid, 8.10.32, 3565.

Beta maritima *L.*

Rustam, May 29, 265 ; Shamiya, fodder plant, native name milaih, June 32, *Qaimaqam of Shamiya* 2357 ; Daltawa, on salty land, native name silaijah (=" little spinach "), 26.5.32, 2513 ; Rustam, 7.5.32, 1.6.32, *Yussef Lazar* 3440, 3441 ; Baghdad, in fields at Rustam, native name hummaidh, 25.4.33, *do.* 3908.

B. vulgaris *L.*

Rustam, Apr. 30, 249.

Beta sp.

Rustam, cultivated in gardens as a vegetable, leaves eaten like spinach, 17.5.32, 1776.

Cornulaca aucheri *Moq.* det. B. L. Burtt.

By the Habbaniya Lake, on highly gypsiferous pebbly sandstone, native name hāthah, 14.10.32, 3533; Hatra, on mounds among the ruins, eaten by sheep and camels, 16.10.32, 3534.

3533 is a form with a short fruit spine (2 mm.).

C. aucheri *Moq.?* det. B. L. Burtt.

Makatu nr. Mandali, 11.5.30, 878; Latifiya Estate, 24.9.30, 927; Ghurfa Plain, nr. Injana, Jabal Hamrin, sandy soil, native name hathah, 7.7.33, 4008.

C. monacantha *Del.* det. B. L. Burtt.

By the Habbaniya Lake, on highly gypsiferous pebbly sandstone, native name sha'rān or ubairah, 14.10.32, 3535.

Chenopodium album *L.* (*Chenopodium* det. J. P. M. Brenan).

Baghdad (Harathiya Estate) by a seepage pool (saline water) near a canal, eaten by sheep, native name hāmidh, 14.7.32, 3233, 3234, 3235.

C. botrys *L.*

Nr. Aradin (Amadia Valley), 1050 m., by the roadside, 3.8.33, and cult. Kew, 26.7.34, 4999.

C. ficifolium *Sm.*

Rustam, in gardens, orchards, etc., native name jināh-al-ghurāb, 7.5.32, *Yussef Lazar* 3435.

C. foliosum (*Moench*) *Aschers.* (*Blitum virgatum* L.).

Arl Gird Dagh, 3000 m., among rocks, 22.7.32, 2862; do., 2400-2700 m., among rocks by a lake, fruit eaten by Assyrians, 24.7.32, 2942.

C. murale *L.*

Rustam, July 29, 170; Baghdad, in cultivated fields, 28.1.31, 1106.

C. opulifolium *Schrad.*

Baghdad (Harathiya Estate), by a saline seepage pool by a canal, 14.7.32, 3234A; Shaikh Adi, 900 m., by a stream, 14.7.32, 3671.

C. vulvaria *L.*

Zawita, 990 m., on rocky cliff near the village, 30.7.33, 4838.

Halocharis sulphurea *Moq.*

Nr. Tuz, on edge of a salt marsh, 29.3.30, 666.

Halocnemum strobilaceum (*Pall.*) *M. Bieb.*

In the Jazira, in the open bed of the Wadi Tharthar near Sabka Um Rahal, native name thilaidh, 15.10.32, 3544; Hit, in a wet salt marsh, reddish-green, 15.10.32, 3547.

Haloxylon articulatum (*Cav.*) *Bunge* subsp. **ramosissimum** *Eig* in Pal. Journ. Bot. J. ser, **3,** 128 (1945).

In the Jazira, in open gypsum desert near Haditha, native name yathnah, 15.10.32, 3519.

H. salicornicum (*Moq.*) *Bunge.*

By Habbaniya Lake, on highly gypsiferous pebbly sandstone, native name rimth or thilaidh, 14.10.32, 3540; 'Iraq-Nedj frontier in sandy desert near Zubair (Basra), one of the principal fodder plants eaten by camels, both green and dry, used also for fuel, native name rimth or hamdh, 4.5.32, *Abdul Wahab Mustafa* 3154.

3154 is too poor a specimen to be identified with certainty.

Noea mucronata (*Forsk.*) *Asch. et Schw.*
Hatra, on mounds by the ruined walls, eaten by sheep and camels, flowers reddish and whitish, native name sirr, 16.10.37, 3553 ; Ghurfa Plain nr. Injana, Jabal Hamrin, sandy soil, 7.7.33, 4007.

Panderia pilosa *F. et M.*
Baghdad (Harathiya Estate), by a saline seepage pool near a canal, native name hamīdh, 14.7.32, 3230, 3231.

Salicornia europaea *L.* var. **herbacea** *L.* s. l. in Sp. Pl. **1,** 3 (1753).
Hit, in a wet marsh, green, eaten by camels, etc., native name thilaidh, 3546.

Salsola hierochuntica *Bornm.* det. B. L. Burtt.
Hatra, on mounds of the ancient walls, 16.10.32, 3536.

S. pestifera *A. Nelson.*
Nr. Amara, common along dry channels bordering the Majar canal, native name chibchab, 14.12.31, 1633 ; Rustam, on river banks, native name suwād, 29.10.32, *Yussef Lazar* 3588 ; Baghdad (Harathiya Estate), by a saline seepage pool near a canal, 14.7.32, 3232.

S. subaphylla *C. A. Mey.* det. B. L. Burtt.
By Habbaniya Lake, on highly gypsiferous pebbly sand-stone, native name bū'aidh, 14.10.32, 3537.

S. vermiculata *L.* subsp. **villosa** (*Moq.*) *Eig* in Pal. Journ. Bot. J. Ser. **3,** 132 (1945).
In the Jazira, in open depressions near the Wadi Tharthar, native name khudhrādh, 15.10.32, 3515 ; Diwaniya, in a thicket near the river, native name qurait (?), 8.10.32, 3564.

The leaves have fallen off these specimens, but they appear to be this species.

Seidlitzia rosmarinus (*Ehrenb.*) *Bunge.*
In the Jazira, in the open bed of the Wadi Tharthar nr. Sabka Um Rahal, 15.10.31, 3545.

Suaeda baccata *Forsk.* (*Schanginia baccata* (Forsk.) Moq.).
Dabouni near Kut, native name tartai', Sept. 29, 191 ; Hilla, fodder plant, native name tartai', Aug. 32, *Civ. Vet. Surgeon of Hilla* 2519A ; Hilla-Diwaniya, on waste land by fields, etc., small vivid green tufted bushes, 15.8.32, 3169 ; Kut, in vegetable gardens near the river, eaten by camels, native name tartai', 15.9.32, *Yussef Lazar* 3487 ; in the Jazira, by a sulphurous spring in the Wadi Tharthar, native name hamudh, 15.10.32, 3550.

Ulbrich in Pflanzenfam. **16c,** 558 (1934) regards *Schanginia* as a section of *Suaeda,* not as a separate genus.

S. mesopotamica *Eig.* e descr. ?
Hafariya (Kut Liwa), 7.10.30, 1035 ; Nasiriya, widely distributed on daim land, native name hamudh, June 32, *Civ. Vet. Surgeon of Muntafiq Liwa,* 2531A.

S. vermiculata *Forsk.*
Nr. Amara, large tufted bush very common, native name tahāmah, 14.12.31, 1635 ; Diwaniya, on marshy bank of Euphrates, bushy tufted plant with succulent bulbous leaves, native name 'arid (?), 2395 ; nr. Dabouni (Kut), on desert land near the river, low bushes 2–3 ft. high forming small mounds, 17.9.32, 3469.

Suaeda *sp.*

Nasiriya, widely distributed in the province on cultivated and daim (unirrigated) land, grazed by sheep and more specially by camels, local herdsmen say that the camels get scab if this plant is absent from their diet, native name hamudh, 15.4.32, *Abd-ar-Rizaq Barbuti* 2531 ; Daltawa, eaten by sheep, camels, etc., native name tartai', 26.5.32, 2451.

POLYGONACEAE.

[**Atraphaxis spinosa** *L.* var. **glauca** *Boiss.* Fl. Or. **4,** 1021 (1879).

Upper Alamut Valley, Persia, 2400–3000 m., low shrub about 2 ft. high on stony ground, Aug. 1931, *Stark* 1603.]

Emex spinosus (*L.*) *Campd.*

Southern desert, W. of Zubair, compact sandy soil, covered by small stones and grit, 8.4.33, *Guest, Eig and Zohary* 5018, 5038.

Oxyria digyna (*L.*) *Campd.*

Arl Gird Dagh, 3000 m., by a melting snow drift, 22.7.32, 2838 ; do., 3300 m., among rocks, 22.7.32, 3068.

Polygonum alpestre *C.A.M.*

Arl Gird Dagh, 3000 m., on rocky ground, 22.7.32, 2864.

P. amphibium *L.*

Seri Hassan Beg, 1800 m., in a ditch by a cornfield, flowers bright pink, 24.7.32, 3025.

The terrestrial form.

P. argyrocoleon *Steud.*

Rustam, May 29, *Rogers* 266 ; nr. Baghdad, July 29, 174 ; Basra, Oct. 29, 302 ; Rustam, in fields, ditches, etc., native name muwassalah, 15.5.31, 1174 ; Rustam, 4.5.31, *Yussef Lazar* 1174A ; Bad'a (N. of Baghdad), native name massalah, 26.5.32, 2503 ; Hilla, on daim or irrigated land, eaten by most animals (horses, sheep, cattle, etc.), native name muwassalah, 28,5.32, *Civ. Vet. Surg. of Hillah* 2526 ; Aziziya, in a *Sorghum* field (especially in ditches, etc.), native name massalah, 17.10.32, 3472 ; nr. Aradin (Amadia Valley), 1050 m., by the roadside, 3.8.33, 4998.

P. aff. **argyrocoleo** *Steud.*

Seri Hassan Beg, 1800 m., on stony ground, 24.7.32, 3020.

The fruit are as smooth as in type material of *P. argyrocoleon*. The perianth is more petaloid than in *P. argyrocoleon*. The leaves are larger than in *P. arenarium* W.K. Possibly a hybrid of *P. argyrocoleon* and some species with a more petaloid perianth.

P. aviculare *L.* s.l.

Baghdad, by a saline seepage pool near a canal, 14.7.32, 3226.

P. bellardi *All.* ?

Baghdad, in cultivated fields, 28.1.31, 1102.

Material too immature for more accurate identification.

P. bistorta *L.* var. **angustifolium** *Meisn.* ex DC. Prodr. **14,** 125 (1856).

Arl Gird Dagh, 3000 m., by a lake in wet places, 22.7.32, 2863.

P. corrigioloides *Jaub. et Spach.*

Mahmudiya, 22.5.30, 923 ; Mahmudiya, cultivated field on Latifiya Estate, 16.5.32, 2394.

P. equisetiforme *Sibth. et Sm.* ?

Rustam, May 29, *Rogers* 266.

The specimen shows no fruits, but is probably this species.

P. lapathifolium *L.* var. **incanum** (*Schmidt*) *Lej. et Court.* Comp. Fl. Belg. 61 (1831).

Diyala River at Rustam, on mud flats left by the receding river in autumn, 24.8.32, 3503.

P. paronychioides *C.A.M.*

Chia-i-Mandali, 2700 m., on top of the ridge among rocks, 19.7.32, 2710.

P. salicifolium *Brouss. ex Willd.* (*P. scabrum* Poir., *P. serrulatum* Boiss.).

Basra, October 29, 303; Amara marshes, growing in shallow water, common grazing plant for water buffaloes, native name qāt, 14.12.31, 1621; Siba nr. Abadan, on mud flats at the edge of the creek, 10.12.31, 1627.

Polygonum scabrum Poir. (1804) is a later homonym for *P. scabrum* Moench. (1794), a synonym of *P. lapathifolium* L.

Rheum ribes *L.*

Maimarut Mts. (Rowanduz Area), 1200 m., eaten by the Kurds like rhubarb, 19.4.32, 2624.

Rumex conglomeratus *Murr.*

Daltawa, in a vegetable garden, native name humaidh, 26.5.32, 2456; Zawita, 900 m., in gardens, native name tirshōk (K.), 27.7.33, 3745.

R. crispus *L.*

Seri Hassan Beg, 1800 m., in a ditch in a cornfield, 24.7.32, 3027.

R. cyprius *Murb.* subsp. **disciformis** *Samuelsson* in Bot. Notis. 512 (1939). (*R. roseus* L. sec. Boiss. et auct. al.).

Jabal Hamrin (nr. Injana), 150 m., on sandy soil among rocks, 6.4.31, 1423, 1425; Jabal Hamrin, 150 m., in shady sandstone pockets between clefts in the rock, 28.3.32, 1814; Jabal Hamrin (nr. Table Mt.), 150 m., on sandy soil, 15.4.32, 2622.

R. dentatus *L.* subsp. **mesopotamicus** *Rech. f.* in Beih. Bot. Centr. **49,** abt. II, 15 (1932).

Hor-ad-dukn, Diwaniya, on irrigated land, fodder plant eaten by sheep, 14.4.32, *Sirkal Mohammed Ali of Muwaihir Estate* 2372; Daltawa, native name humaidh, 26.5.32, 2456A; Baghdad (Harathiya Estate), by a saline seepage pool near a canal, 14.7.32, 3238; Rustam, native name arif-ad-dik, 1.6.32, *Yussef Lazar* 3436; Diyala River at Rustam, on mud flats left by receding river in autumn, 24.9.32, 3508; Aziziya, along channels in a *Sorghum* field, 6.10.32, 3569; Baghdad, fields at Rustam, native name hummaidh, 25.4.33, *Yussef Lazar* 3907.

R. aff. **pontico** *E. H. L. Krause emend. Rech. f.*

Arl Gird Dagh (nr. Rust), 2400 m., among rocks, 24.7.32, 2930.

The basal leaf of this specimen is markedly cordate. In the key to this subsection of *Rumex* by Rechinger f. in Fedde Rep. Sp. Nov. **31,** 223–283 (1933), our specimen comes down to *R. ponticus* which is described however as having cuneate bases to the radical leaves. The fruit is like that of *R. ponticus* (*Sintenis* 7072).

R. pulcher *L.* subsp. **anodontus** (*Hausskn.*) *Rech. f.* l.c. 34.

Rowanduz Gorge, 540 m., by a stream, 17.7.32, 3018.

R. scutatus *L.*

Jabal E.N.E. of Seri Hassan Beg, 2100 m., forming pretty white clumps on the stony mountain side, 24.7.32, 2901 ; do., forming beautiful clumps of a delicate pink colour, 2904.

Rumex sp.

Suwara Tukka (Kurdistan), 1050 m., 10.10.31, 477.

This specimen shows fruit, but no leaves. Probably a hybrid.

ARISTOLOCHIACEAE.

Aristolochia maurorum *L.*

Sulaimaniya-Kirkuk, in waste places up to 900 m., 30.3.32, *Ludlow-Hewitt* 1932 ; Zawita Gorge, 900 m., 23.4.32, 2203 ; Dohuk, 450 m., in a cornfield on stony land, deep underground woody rhizome, 24.4.32, 2235 ; Dohuk, chiefly on plain, useful for sheep grazing, roots used as medicine for sheep and cattle, native name ratl sak (K.), 5.5.32, *Mekki Beg* 3253 ; nr. Kirkuk, 420 m., on bare denuded hills, 13.4.33, *Guest, Eig and Zohary* 5100.

A. maurorum *L.* var. **latifolia** *Boiss.* Fl. Or. **4,** 1080 (1875).

Razinook (nr. Rowanduz), Kurdistan, c. 900 m., 10.5.33, *Cuckney* 3840.

THYMELEACEAE.

Daphne acuminata *Boiss. et Hoh.*

Kurdish hills, 1200–1800 m., shrubs, very sweet scented with red berries, Aug. 31, *Ludlow-Hewitt* 1517 ; Chia-i-Mandali, from Walza-Walash, 1200–1800 m., on the mountain side, a very common shrub at this altitude, used by the Assyrians as a cure for rheumatism, chopped branches boiled in water and the decoction applied to the place, 18.7.32, 2675 ; Ser Amadia, 1800 m., on top of the ridge, 3.8.33, 4987.

Lygia passerina (*L.*) *Fasano.*

Kani Dolman hills, Kirkuk, 390 m., on dry stony rounded hill-top, 30.4.33, 4360 ; Balad Sinjar–Tal Afar, 330 m., on semi-natural steppe, 28.4.33, 4169.

4169 shows no flowers nor fruits, but appears to be this species.

ELAEAGNACEAE.

Elaeagnus angustifolia *L.*

Baghdad, cultivated, 21.5.33, 3879.

LORANTHACEAE.

Loranthus europaeus *L.*

Marmarut Mt. (nr. Rowanduz), 1200 m., parasitic on oak (see 2064A *Quercus aegilops*), 19.4.32, 2064; Suwara–Tukka, N. of Dohuk, Kurdistan, 10.10.31, 1590.

SANTALACEAE.

Thesium sp.

Zawita, 1230 m., in open oak forest, 30.7.33, 4860.

The specimen is too poor for more accurate determination.

EUPHORBIACEAE.

Andrachne aspera *Spreng.*

Dohuk Gorge, 450 m., on a limestone cliff, 25.7.33, 3704.

A. telephioides L.

Nr. Rustam, Aug. 29, 162 ; Rustam, on dry ground in a yard, 16.6.31, *Yussef Lazar* 1187 ; do., Rustam, native name lāmmah, 31.10.32, do. 1187A ; Daima nr. Mandali, 26.3.32, 1726 ; Jabal Hamrin (nr. Table Mt.), 150 m., growing from a crack on a rocky slab, 30.3.32, 1895; Bad'a (N. of Baghdad), on sandy loam in a vegetable garden, native name lāmah, 26.5.32, 2500 ; in the Jazira, in small depressions on gypsum desert, native name lāmah, 17.10.32, 3514 ; Hatra, among the ruins, native name lāmah, 18.10.32, 3560 ; Aziziya, in a *Sorghum* field, 6.10.32, 3573 ; Kirkuk Province, useful grazing plant, native name wasmiyah, 13.5.33, *Ali Effendi Hadari* 3931 ; Ain-al-Husan (nr. Sinjar), 315 m., on open *Poa* steppe, 28.4.33, 4201.

Chrozophora verbascifolia (*Willd.*) *Juss.*

Rustam, 2.6.31, *Yussef Lazar* 92 ; do., July 29, 166 ; nr. Dohuk, 600 m., by a roadside, 10.10.31, 1668 ; Rowanduz Gorge, 600 m., on the mountain side, 25.7.32, 2983 ; Arbil, 540 m., on stony red loam in cultivated fields (fallow), 17.7.32, 2999.

Euphorbia aleppica *L.*

Mosul to Ain-Sifni, 360 m., fields, 11.7.33, 4034A.

E. chamaesyce *L.*

Rustam, 2.6.31, *Yussef Lazar* 1189 ; Bada' (N. of Baghdad), on sandy loam in a vegetable garden, native name lāmah, 26.5.32, 2499.

E. chamaesyce *L.* var. **canescens** (*L.*) *Boiss.* ex DC. Prod. **15,** pt. 2, 35 (1862).

Haditha, in fields and gardens, native name albainah, 15.10.32, 3517 ; Al Qosh, 450 m., in a *Sorghum* field, 15.7.33, 3679.

E. condylocarpa *M.B.*

Rowanduz Gorge, 750 m., 18.4.32, 2100.

The root of *E. condylocarpa* is described by Boissier Fl. Or. **4,** 1102 (1879) as ovate-globose. In Guest's specimen it is a long tapering fusiform structure. Intermediates below the two shapes are shown in some of the other material in Herb. Kew.

E. cornuta *Pers.*

Southern Desert nr. Jaliba, on hard sandy soil strewn with pebbles in *Haloxylon* association, 8.4.33, *Guest, Eig and Zohary* 5068.

E. denticulata *Lam.*

Amadia, 900–1800 m., native name shîri mār, 28.3.31, 1212 ; Chia-i-Mandali (nr. Walza), 1950 m., on the stony hillside, 18.7.32, 2695.

E. falcata *L.*

Haditha, along a water channel in a dukhn [millet] field, 15.10.32, 3523 ; Baghdad, in date gardens at Karada, May 33, 3878 ; Southern desert (near Jaliba), on hard sandy soil strewn with small pebbles in an *Haloxylon* association, 8.4.33, *Guest, Eig and Zohary* 5070.

E. falcata *L.* var. **ecornuta** *Boiss.* Fl. Or. **4,** 1111 (1879).

Daltawa, in an onion field, used for eyes of sheep, etc., native name dawa' ghanam (?) (=" sheep medicine "), 26.5.32, 2482 ; Dohuk to Mosul, 360 m., fields, 21.7.33, 3683 ; Mosul to Ain Sifni, 360 m., fields, 11.7.33, 4036 ; Balad Sinjar–Tal Afar, 330 m., on semi-natural steppe, 28.4.33, 4171.

E. falcata *L.* var. **rubra** (*Cav.*) *Boiss.* Fl. Or. **4,** 1111 (1879).

Almost certainly collected near Mosul or Kirkuk, 270.

E. granulata *Forsk.*

Aziziya, on saline ground in a *Sorghum* field, flat spreading plant, 17.9.32, 3470 ; Kut, in vegetable gardens, native name um-al-halîb, 17.9.32, *Yussef Lazar* 3482 ; nr. Fatta Gorge, in small sandy patches round *Zizyphus* bushes in open desert, native name albainah, 18.10.32, 3513 ; Aziziya, in a *Sorghum* field, 6.10.32, 3572.

It seems doubtful if *E. turcomanica* Boiss. is really distinct from this species.

E. granulata *Forsk.* var. **glabrata** *Boiss.* ex DC. Prodr. **15**, pt. 2, 34 (1862).

Kut, Sept. 29, 195 ; Aziziya, in a *Sorghum* field, 17.10.32, 3471.

E. guestii *Blakelock* sp. nov. (Sect. *Galarrhei* Boiss. : *E. gaillardoti* Boiss. et Blanche pro parte) ; ab *E. gaillardoti* bracteis foliaceis latitudine longioribus basi rotundatis, seminibus foveolatis cinereis, inflorescentia corymboso-umbellata distinguitur.

Herba annua 18 36 cm. alta. *Caulis* 8–24 cm. longus, 2–6 mm. latus, crassus vel crassiusculus, striatus, glaber, in sicco luteo-virescens. *Folia* caulina plerumque evanida, lineari-spathulata vel lanceolato-spathulata, glabra, margine integra apicem versus minute denticulata, usque 2·5 cm. longa, 0·9 cm. lata. *Inflorescentia* irregulariter corymboso-umbellata, radiis 4–11. *Inflorescentiae rami* crassiusculi, striati, glabri, in sicco luteo-virescentes, 6·5–27 cm. longi, c. quinquiens dichotomi. *Bracteae foliaceae* ovato-orbiculares, subcoriaceae, glabrae, subtus in sicco ± purpureo-suffusae, apicem versus denticulatae, apicem carinato-mucronatae, basi rotundatae, 22- 3 mm. longae, 15–4 mm. latae. *Cyathium* 2 mm. longum, glandulis transverse trapezoideo-ellipticis. *Capsula* globoso-tricocca profunde trisulcata, laevis, glabra, 2 mm. longa, 2 mm. lata, coccis rotundatis. *Semina* ellipsoidea subquadrangularia, apice basique rotundata, irregulariter foveolata, cinerea in foveolis nonnunquam nigris (immatura lutea vix foveolata), c. 1·5 mm. longa, 1 mm. lata, caruncula parva, mox decidua.

N. 'Iraq. Dohuk- Mosul, c. 300 m., very common in cultivated fields, 10.10.31, *E. R. Guest* 1583 ; Al Qosh, 450 m., in a *Sorghum* field, 15.7.33, *do.* 3678 ; Mosul-Ain Sifni, 360 m., fields, 11.7.33, *do.* 4034 (type of *E. guestii*), 4035.

The following specimens are at Kew, not in the Rustam Herbarium :

Asia Minor. Beschabur, Mesopotamia, 1841, *Kotschy* 398 (syntype of *E. gaillardoti*) ; Anatolia, 1844, *Noë.*

Syria. Mejdel Anjar, 10.10.1860, *Hooker et Hanbury* ; Medjeel, Antilebanon, Feb. 1866, *H. Christy* ; between Haleb and the Euphrates in fields, 23.8.1893, *Bornmüller* 595 ; Ain-esh-Sha'arah, Antilebanon, 25.7.1892, *Post*, Herb. Kew. et Brit. Mus. ; Sanamayn [Sanamein], 800 m., fields, 27.6.1932, *J. E. Dinsmore* 11069.

Kotschy's, Hooker and Hanbury's, Post's and Dinsmore's specimens are too immature to have any seeds. They show the other characters of *E. guestii* including the characteristic purple tinge on the undersurface of the bract-leaves.

This species has been figured twice under the name *E. gaillardoti.* Once in Boissier's Ic. Euphorb. t. 69 (1866). The plate contains a large habit drawing of *E. guestii* in the centre with the leaf-serration rather exaggerated and also the smooth seeds of *E. gaillardoti* and a portion of an inflorescence on the left which might be intended for either species. The other illustration is a photograph in Boulomoy's Fl. du Liban et de la Syrie t. 398, fig. 2 (1930) ; this shows the bract-leaves and umbellate branching of *E. guestii.* In Boulomoy's text (p. 307) the seed are described as smooth, obviously in confusion with *E. gaillardoti* and presumably from another specimen than that figured.

The following new species may be described here, although not represented in the Rustam Herbarium.

E. unilateralis *Blakelock* sp. nov. ; ab *E. gaillardoti* Boiss. et Blanche inflorescentiae nodis supernis 4 vel pluribus unilateralibus, capsula globosa haud sulcata, seminibus majoribus nitidis, carunculis persistentibus differt.

Herba annua 40–50 cm. alta. *Caulis* crassiusculus, leviter striatus, glaber, rubro-suffusus, 4–5 mm. latus. *Folia* caulina evanida. *Inflorescentia* irregulariter corymboso-umbellata, radiis 5–14. *Inflorescentiae rami* leviter striati, glabri, rubro-suffusi, 3–8 cm. longi, bis ad quinquiens dichotomi vel trichotomi nodis supernis 4 vel pluribus unilateraliter ramosi. *Bracteae foliaceae* orbiculares, triangulari-orbiculares vel late ovatae infernis ovatis, membranaceae, glabrae, in sicco virides, apicem versus denticulatae, apice carinato-mucronatae, basi truncatae vel rotundatae, 25–5 mm. longae, 16–6 mm. latae. *Cyathium* 1·5–2 mm. longum, glandulis transverse ellipticis. *Capsula* globosa, laevis, glabrescens vel sparsissime piloso-pubescens, 2–3 mm. longa, 2–3 mm. lata. *Semina* ovoidea subcompressa subcarinata, laevia, nitida, brunnea, c. 2 mm. longa, 1·5 mm. lata.

N. ‘Iraq. Sulaimaniya, 5–6.7.31, *H. Field and Yussef Lazar* 966.

Asia Minor. Mardin, Rischemil, Kurdistania, in vine-yards, 23.7. 1888, *P. Sintenis* 1362 (type).

Palestine. Lake Hula, sea level, moist ground, 16.10.1935, *R. F. Jones* 184, Brit. Mus.

All three of these specimens had been previously named as *E. gaillardoti*. *Jones* 184 has the bract leaves longer than wide, in the other two specimens they are wider than long.

[*E. gaillardoti* Boiss. et Blanche Diagn. **2,** no. 4. 84 (1859) ; Boiss. ex DC. Prod. **15,** pt. 2, 118 (1866), Fl. Or. **4,** 1097 (1879) ; Boiss. Ic. Euph. t. 69 (1866) ; Bouloumoy Fl. Liban et Syr. texte, 307 (1930) excl. icon. ; Post Fl. Syr. Pal. and Sinai, ed. 2, **2,** 496 (1933) pro parte.

Inflorescence dichotomo-corymbose, branches dichotomous to apex. *Bract-leaves* orbicular or triangular orbicular, membranous, green when dried, base truncate or rounded, 12–3 mm. long, 14–3·5 mm. wide. *Cyathium* 1–1·5 mm. long. *Capsule* globose tricoccous, deeply trisulcate, smooth, glabrous, 1·5–2 mm. long, 1·5–2 mm. wide, lobes rounded. *Seed* ovoid, subterete, subcarinate, smooth, not shiny, brown, c. 1·5 mm. long, 1 mm. wide, caruncles small soon deciduous.

Syria. Raschaya, 1350 m., 7.7.1855, *Kotschy* 251, Kew and Brit. Mus. (syntype) ; Mejdeel Andjar, Antilebanon, 17.12.1816 [?], *Gaillardot* 2227.

Transjordan. Birkat Dân, Sept. 1875, *Post* 37.

The reasons for confining the name *E. gaillardoti* to *Kotschy* 251 rather than to *Kotschy* 398 may be briefly indicated here. Boissier clearly regarded *E. gaillardoti* as having smooth dark-coloured seeds (Fl. Or. **4,** 1095, 1097). This applies to *Kotschy* 251 and *Gaillardot* 2227. The latter specimen is not cited by Boissier, but it is labelled *E. gaillardoti* in Boissier's handwriting. I assume it therefore to be a match for " Ouadi Barrada Antilebani, *Gaillardot* " cited in the Diagnoses l.c. as type material. *Kotschy* 398, which shows no seed, is in its other characters clearly another species and is here removed to *E. guestii*.]

The main differences between these three species are summarized below.

	E. gaillardoti	*E. unilateralis*	*E. guestii*
Inflorescence	dichotomous, branching to apex	corymboso-umbellate, unbranched at uppermost 4 or so nodes	corymboso-umbellate, branching to apex
Bract-leaves	wider than long, base truncate or rounded.	wider than long or longer than wide, base truncate or rounded	longer than wide, base rounded
Capsule	grooved	not grooved	grooved
Seeds	smooth, brown, 1·5 mm. long.	smooth, brown, 2mm. long	foveolate, grey, 1·5 mm. long
Caruncle	caducous	persistent	caducous

E. helioscopia *L.*

Diana nr. Rowanduz, 26.3.30, 708 ; Baghdad, in date gardens at Karada, native name khunnaiq-ad-dijāj, 20.2.31, 1087 ; Amadia, 1020 m., 28.3.31, 1216 ; Dohuk, in a peach garden, native name um-al-halîb, 26.4.32, *Yussef Lazar* 3366.

E. peplus *L.*

Baghdad (in a Karada date garden), 20.2.31, 1086 ; do., 24.2.33, *Yussef Lazar* 3877.

E. petiolata *Banks et Sol.* (*E. lanata* Sieb.).

Bad'a (N. of Baghdad), native name um-al-halaib (="mother of milk"), 26.5.32, 2495 ; Arbil, 440 m., on stony red loam in cultivated fields (fallow), 17.7.32, 2998 ; Rustam, native name um-al-halîb, 4.6.32, *Yussef Lazar* 3425 ; Hatra, among the ruins, poisonous to animals, native name sahal, 17.10,32, 3561.

E. pilulifera *L.*

Baghdad, 20.11.20, *Paranjpye* 20.

E. teheranica *Boiss.*

Balad Sinjar–Tal Afar, 330 m., on semi-natural steppe, 28.4.33, 4170.

E. tinctoria *Boiss. et Huet.*

Diana nr. Rowanduz (Kurdistan), 750 m., 12.10.31, 496 ; Khanzad Pass (nr. Arbil), 480 m., on stony hill-side, 17.4.32, 2013 ; Arbil, 420 m., in a cornfield on red loam, 20.4.30, 2131 ; Chia-i-Mandali (Walash to Walza), 1200–1800 m., very common on the hill-side, brilliant yellowish green, native name shi'arak, 18.7.32, 2656 ; nr. Ain Sifni, 450 m., stony hill-side pastures, 12.7.33, 4043 ; Atrush, Kurdistan, 885 m., on red marl banks in open pine forest, 13.7.33, 4397 ; Badi nr. Dohuk, 825 m., on open hill-side, 25.7.33, 4415 ; Zawita Valley, 825 m., on red marl banks, 25.7.33, 4435 ; Zawita, 840 m., on rocky mountain ridge, 26.7.33, 4489 ; do., 1200 m., on rocky plateau, 28.7.33, 4576 ; do., 720 m., on red limestone scree soil, 29.7.33, 4742 ; Ser Amadia, 1770 m., on mountain side, 3.8.33, 4976.

Some of these are var. *schizoceras* Boiss. ex DC. Prod. **15,** pt. 2, 166 (1862).

E. virgata *W.K.* var. **orientalis** *Boiss.*

Chia-i-Mandali, 1950 m., in a ditch by a cornfield, 20.7.32, 2768.

Euphorbia sp.

Nr. Tauq, 195 m., on steppe soil, 13.4.33, *Guest, Eig and Zohary* 5095. Material too immature for identification.

URTICACEAE.

Broussonetia papyrifera (L.) Vent.

Baghdad (Hinaidi) ornamental trees in No. 1 Mess Garden, 30ft. high, doubtless alien, 30.6.32, 1792.

Celtis australis *L.*

Rustam (alien), 15.3.31, 1122.

C. tournefortii *Lam.*

Shaikh Adi (N. of Mosul), 825 m., native name tawak (K.), 10.10.31, 1644 ; Amadia, 1350 m., at the foot of Gulli Mazurka, 3.8.33, 4992.

Ficus carica *L.* var. **rupestris** *Hausskn. ex Boiss.* Fl. Or. **4,** 1154 (1879) (det. V. S. Summerhayes).

Zakho Pass (N.W. of Mosul), 750 m., on mountain side, 24.4.32, 2247 ; Zawita, 1110 m., in pine forest on rocky limestone slope, 27.7.33, 4504 ; Zawita, 1065 m., in pine forest on limestone crags, 30.7.33, 4766.

The numerous varieties of *Ficus carica* L. tend to pass into one another, but the gatherings cited all appear to be referable to the above variety. The leaves vary considerably in the amount of indumentum and also tend often to be more or less shortly lobed, not always undivided as suggested in Flora Orientalis.

Morus alba *L.*

Rowanduz Gorge (Kurdistan), 600 m., 12.10.31, 459 ; Rustam Farm, cultivated for feeding silk-worms, native name tūth or tukg, 20.3.32, *Yussef Lazar* 1828, 1828A ; Arl Gird Dagh (at Nawanda), 1500 m., large trees at the village, fruit white, 20.7.32, 2777.

M. nigra *L.*

Arl Gird Dagh (at Nawanda), 1500 m., large trees at the village, fruit black, 20.7.32, 2775.

Parietaria alsinefolia *Del.*

Makhlat, 165 m., among rocks under small cliff, 29.4.33, 4279.

P. judaica *L.*

Rowanduz Gorge, 600 m., 12.10.31, 493 ; do., on rocks near a waterfall, 18.4.32, 2091 ; Dohuk, 450 m., on a rocky cliff, 22.4.32, 2173 ; Rowanduz Gorge, 600 m., on a rocky cliff, 25.7.32, 2970 ; Dohuk Gorge, 450 m., on a limestone cliff, 25.7.33, 3707.

These show larger leaves than most specimens of *P. judaica* in Herb. Kew., but they closely resemble, 3707 especially, *Kotschy* 329 from Mt. Gara.

P. lusitanica *L.*
Makhlat, 165 m., among rocks under small cliff, 29.4.33, 4279A.

Ulmus sp.
Ryatt Valley (foot of Arl Gird Dagh), 1050 m., by stream in the valley, small tree, 20.7.32, 2773.

Dr. Melville may be describing this as a new species.

Urtica dioica *L.*
Chia-i-Mandali (nr. Walash), 1350 m., 18.7.32, 2650 ; Arl Gird Dagh (nr. Nawanda), 1800 m., by a stream, 20.7.32, 2781 ; Zawita, 900 m., damp places, ditches, etc., in gardens, 27.7.33, 3748.

U. pilulifera *L.*
Makhlat, 165 m., among rocks under small cliffs, 29.4.33, 4283.

Plantanaceae.

Platanus orientalis *L.*
Bursorini Gorge (Kurdistan), large spreading trees, growing in the valley, native name chinār, 12.10.31, 462 ; Shaqlawa, Kurdistan, 23.3.30, 568 ; Amadia Valley (Kurdistan), 750 m., fine spreading trees by the mountain streams, 31.3.31, 1330 ; Bursorini Gorge (Kurdistan), 750 m., 10.10.31, 1566 ; Shaikh Adi, 750 m., by the stream, fine spreading trees, 3662.

Juglandaceae.

Juglans regia *L.*
Rowanduz Gorge, 450 m., fair sized tree, 20.4.32, 2142 ; Ryatt Valley, 900–1200 m., by streams near villages, large well grown walnut trees, 20.7.32, 2751 ; Shaqlawa, 900 m., in orchards near the villages, large well grown walnut trees, 17.7.32, 3009.

Casuarinaceae.

Casuarina cunninghamiana Miq.
Rustam, grown from imported seed, not indigenous, Dec. 31, 331, 332.

Cupuliferae.

Quercus aegilops L. s.l.
Rowanduz, Kurdistan, 25.3.30, 584 ; Amadia, 750 m., by a mountain stream in the main valley, 31.3.31, 1332 ; Marmarut Mt. (nr. Rowanduz), 1200 m., on mountain side, small tree with mistletoe growing on it (see 2064, *Loranthus europaeus*), 19.4.32, 2064A ; Seri Hassan Beg, 1650 m., small trees forming open forest on the hill-side, 24.7.32, 3031, 3033 ; Iskeftendiwan, nr. Shaikh Adi, 750 m., in a graveyard, fine spreading tree 20–30 ft. high, 14.7.33, 3667 ; Zawita, 600 m., on rocky (limestone) slope, 27.7.33, 3736 ; Zawita Valley, 825 m., on red marl banks, 25.7.33, 4432 ; Zawita range, 1050 m., on rocky mountain slope, 25.7.33, 4462 ; do., 840 m., on rocky mountain slope, 26.7.33, 4487 ; do., 1070 m. in clump of pines by a flat outcrop of limestone terraces, 28.7.33, 4553 ; do., 1200 m., on rocky plateau, 28.7.33, 4570 ; do. 1080 m., in pine forest on steep rocky slope, 28.7.33, 4624 ; do., 990 m., in small rocky ravine, 30.7.33, 4777 ; do., 1065 m., in oak forest, 1.8.33, 4937.

These specimens show only vegetative parts or immature fruit, so that it is impossible to decide in which subspecies they should be included. I am indebted to Messrs. G. Chapman, Forest Officer and J. B. Gillett, late Department of Agriculture, 'Iraq, for much information on the ecology and economics of the oaks in 'Iraq. This information is given in the notes below, separately from Mr. Guest's field-notes attached to the specimens. *Q. aegilops* is the most widespread oak in the country and the only species present in the drier parts (e.g. Jabal Sinjar).

Q. vesca Kotschy is regarded by Camus (Les Chênes **1,** 524 (1936–8), as a possible hybrid of *Q. libani* and *Q. aegilops* subsp. *brantii.* Examination of type material (*Kotschy* 555) confirms this view. A specimen without acorns (Kuh-Sefin, Schaklava, nr. Erbil, 12.5.1893, *Bornmüller* 1818), which had been named *Q. vesca,* is better regarded as *Q. aegilops* L.s.l. Mr. Gillett tells me that *Q. libani* does not occur near Schaklava, where the hills are too low and too dry. *Q. oophora* Kotschy is also tentatively given the same hybrid origin by Camus, and again type material at Kew (*Kotschy* 554) confirms this opinion.

Q. aegilops *L.* subsp. **brantii** (*Lindl.*) *Camus* in Les Chênes **1,** 544 (1936–8).

Bursorini Gorge, Kurdistan, 750 m., native name balūt, 12.10.31, 465 ; Rowanduz Gorge, Kurdistan, 600 m., native name balūt, 12.10.31, 489 ; Suwara Tuka, 1200 m., 10.10.31, 1576.

These show the broad acorn characteristic of subsp. *brantii,* certainly the common subspecies in 'Iraq.

Subsp. *persica* (Jaub. et Spach) Blakelock stat. nov. is not represented in Rustam Herbarium. Its occurrence in 'Iraq, while probable, is not proved by any specimen in the Kew Herbarium. Kotschy's specimen from Gara, which is cited by Jaubert and Spach in the original description of *Q. persica* (Ill. Fl. Or. **1,** t. 55 (1843)), was collected in August and shows no fruit. It therefore cannot be positively stated, that this specimen is not subsp. *brantii,* which is certainly common in that area. Mr. Gillett has seen only one specimen apparently of subsp. *persica* from Salahaddin, Pirmum Dagh, 'Iraq ; this has not yet arrived at Kew. It is to be noted that Camus l.c. figures the extremes in acorn-shape of these subspecies. Material from Persia is available with the acorn more or less intermediate in shape.

DISTR. (of subsp. *brantii*) Asia Minor, N. 'Iraq.
(of subsp. *persica*) N. Iraq ?, Persia.
(of entire species) S. Italy, Balkan Peninsula, Asia Minor, Syria, Palestine, N. ' Iraq, Persia.

Quercus infectoria *Oliv.*

Bursorini Gorge, Kurdistan, 750 m., 12.10.31, 464 ; Suwara Tuka, 1200 m., gall oak, native name afs, 10.10.31, 1575 ; Rowanduz Gorge, 750 m., 18.4.32, 2099 ; Marmarut Mt. (nr. Rowanduz), 750–1350 m., on the mountain side, small tree, 19.4.32, 2087 ; Ryatt Valley, 450 m., on the open hillside, small trees about 20 ft. high, 20.7.32, 2747 ; Seri Hassan Beg, 1650 m., small trees forming open forest on the hill side, 24.7.32, 3030, 3032, 3034 ; Iskeftendiwan, nr. Shaikh Adi, 750 m., in a graveyard, fine spreading tree 20–30 ft. high, 14.7.33, 3668 ; Zawita, c. 900 m., 25.7.33, 3700 ; Zawita Valley, 945 m., among limestone crags, 25.7.33, 4449 ; Zawita, 1050 m., in pine forest on N. slope, 27.7.33, 4507 ; do. 1010 m., in oak forest on steep rocky slope, 28.7.33, 4619 ; do., 1020 m., in pine forest on steep red marl slope, 28.7.33, 4639.

These specimens show a great variation in leaf shape and margin from deeply sinuate-lobate to entire. They all appear to belong subsp.

boissieri (Reuter) Gürke (see Camus l.c. **2,** 187 (1938)). *Q. pfaeffingeri* Kotschy is only a form of this with entire or subentire leaf-margin (e.g. *Guest* 3668, *Bornmüller* 1811). There is type material of *Q. pfaeffingeri* at Kew.

Q. infectoria is intermediate in its moisture requirements between *Q. libani* and *Q. aegilops.* Where the conditions are suitable (e.g. near Rowanduz) it is about as common as *Q. aegilops.*

DISTR. Macedonia, Thrace, Asia Minor, Cyprus, Palestine, Syria, N. 'Iraq, N. Persia.

Q. libani *Oliv.* (*Q. regia* Oliv.).

Seri Hassan Beg, 1800 m., on the mountain side, large tree 40 ft. high with a good bole, 24.7.32, 2898 ; Ser Amadia, Kurdistan, c. 1800 m., oak branches used for making shelters on summer camping grounds, native name dindār (or dildār (K)), 2.8.33, 3784.

Q. regia Lindl. Bot. Reg. 1840, no. 73 is a synonym of *Q. libani.* Type material (Kurdistan, 1840 *Brant*) is at Kew. Handel-Mazetti formed the same opinion from a specimen collected by Kotschy (in Ann. K. K. Nat. Hofmus. **26,** 128 (1912)). He described a lusus *pinnata* Hand.-Mazz. l.c. with the leaves pinnatifid into remote unequal long linear or triangular-linear segments, as wide as the primary lamina and confluent towards the base of the leaf. Nábělek collected a specimen of this *lusus* between Hasitha and Amadia on the Turkey-'Iraq frontier (in Publ. Fac. Sci. Univ. Masaryk **105,** 23 (1929)).

The bole is more erect, smoother and less branched in *Q. libani* than in *Q. aegilops* or *Q. infectoria.* It occurs in the cooler damper climates of the higher mountains, where it may be dominant, especially in the N.E. corner of ' Iraq.

DISTR. Asia Minor, Syria, N. 'Iraq.

Q. macranthera *Fisch. et Mey.*

Seri Hassan Beg, 1800 m., on the mountain side, large well-grown tree about 40 ft. high with good bole, 24.7.32, 2899.

This is the only specimen seen from 'Iraq. In view of the amount of material available of the other oaks, it is obviously not a common species ; probably confined to the higher and damper zone of the forest.

DISTR. Caucasus, Asia Minor, N. 'Iraq, N. Persia.

Guest's records of *Q. petraea* (Mattuscha) Liebl. (*Q. sessiliflora* Smith) and *Q. castaneifolia* C.A.M. are misidentifications (in Dept. of Agric. 'Iraq Bull. no. 27, 82 (1933)).

There are four vernacular names in general use for oaks in 'Iraq—

Afus (af's) is really the name of one of the numerous types of gall, well known and of economic importance as a tanning agent. The name is connected with the widespread (classical ?) Arabic name of the Cypress, whose cones show some resemblance to this gall. The galls only occur on *Q. infectoria* and the name afus is secondarily used for this species. Māzi or māzū is the Kurdish name for this species.

Balūt is properly speaking the name for the acorn, and is sometimes applied to the fruit of any species of *Quercus*. As, however, the acorn of *Q. aegilops* is the largest, is used as food and the cup as a tanning agent, the name is secondarily applied to this species. Barū is a Kurdish form of the word balūt. *Quercus balout* Griff. is a native of Afghanistan not of 'Iraq.

Dindar is the chief of several Kurdish names for *Q. libani*.

All species are used for charcoal (of great importance in 'Iraq) and to a lesser extent for timber and firewood. The timber is generally small, twisted and of poor quality. The leaves of *Q. infectoria* are much cut for winter fodder and the trees near the villages are usually pollarded on that account. *Q. aegilops* may be used less often for the same purpose, where *Q. infectoria* does not occur. Manna in 'Iraq is a sugary excretion produced as the result of an insect attack on the leaves of *Q. aegilops*, it falls on the dead leaves and stones below the trees and is thence collected, boiled to remove twigs, small stones, etc., and sold in Baghdad and elsewhere at a good price as a sweetmeat. The acorns of *Q. aegilops* are also sold in Baghdad as a food ; they are rather bitter and indigestable and regarded as a food for the poor.

A key to the species of *Quercus* found in 'Iraq is given below—

A. Leaf-margin sinuate-lobate to entire, (if mucronate, mucrones up to 0·5 mm. long). Styles short, dilated and flattened at the apex.

B. Stipules persistent, linear, silky hairy ; bud scales pubescent. Mature leaves sparsely stellate-pubescent above, stellate–tomentose below, lamina up to 10 cm. or more long. *macranthera* F. et M.

BB. Stipules not persistent ; bud scales pubescent or glabrous. Mature leaves glabrescent to stellate-pubescent, less pubescent above, lamina up to 9 cm. (rarely 10 cm.) long but usually smaller . . . . *infectoria* Oliv.

AA. Leaf-margin dentate, markedly mucronate (mucrones up to 1–3 mm. long). Styles subulate at apex.

C. Mature leaves lanceolate, glabrous, glabrescent or sparsely stellate-pubescent, shining . . . . *libani* Oliv.

CC. Mature leaves ovate, oblong or oblong-lanceolate, stellate-tomentose below, stellate-pubescent above . . . *aegilops* L.

D. Acorns ellipsoid tapering at both ends, 1·8–4 cm. long, 1·2–1·5 cm. wide, cupule obconic . . . . . . *aegilops* subsp. *persica* (Jaub. et Spach) Blakelock

DD. Acorns ovate or subcylindric, less tapering at the ends 3–4·5 cm. long, 1·8–2·7 cm. wide, cupule hemispherical *aegilops* subsp. *brantii* (Lindl.) Camus.

SALICACEAE.

Populus alba *L.*

Baghdad, May 32, 2545 ; Chia-i-Mandali, 1350 m., in a hedge near a village, trees 20 ft. high, 20.7.32, 2758.

P. euphratica *Oliv.*

Amadia, 750 m., by a stream in the main valley, 31.3.31, 1331; Rustam, common in thickets along the Diyala river, native name gharab, 4, 13, 28.3.31, *Yussef Lazar* 1494, 1494A, 1494B ; Jindian (Kurdistan), 750 m., 12.10.31, 1549.

Salix acmophylla *Boiss.*

Rustam, 7.3.31, *Yussef Lazar* 1414 ; Rustam, on channel banks (cultivated), also found in natural thickets on the Euphrates, etc., native name safsāf, Feb. 32, *do.* 3317 ; Baghdad, roadside avenue at Rustam (planted) and in a grove along the Diyala River at Rustam, 9.3.33, *do.* 3915, 3916, 3917.

Handel-Mazetti has a note on this species, in which he sinks *S. persica* Boiss. (in Ann. K.K. Nat. Hofmus. **26**, 128 (1912)). Only male catkins have been seen from 'Iraq.

S. acmophylla *Boiss.* ?

Bursorini Gorge (Kurdistan), 750 m., growing in the bed of the stream, 12.10.31, 463 ; Ryatt Valley (foot of Arl Gird Dagh), 1050 m., by a stream, 20.7.32, 2772.

These specimens show only vegetative parts. Both are heavily galled. The leaves match those of *Kotschy* 400 cited by Boissier (Fl. Or. **4.** 1183 (1879) as this species.

S. aegyptiaca L. (*S. medemii* Boiss.).

Amadia (Kurdistan), 1050 m., 26.3.21, 1227.

Salix sp.

No precise locality, Mar. 30, 757.

Possibly a hybrid of *S. babylonica* with *S. alba* L or *S. acmophylla.*

CERATOPHYLLACEAE.

Ceratophyllum demersum *L.*

Amara marshes, submerged water weed, native name shinbilān, 13.12.31, 1562.

The Botany of Tropical Africa.

A meeting of botanists working on the taxonomy of tropical African plants was held at the Herbarium, Royal Botanic Gardens, Kew, on 15th September 1950, both with a view to improving the co-operation in that field and to correlating the African regional floras now in course of preparation at the British Museum, Brussels and Kew. Twenty-one botanists were present representing six institutions and four countries. A resolution was unanimously passed forming an Association for the taxonomic study of the flora of tropical Africa. A full account of this meeting, together with the detailed aims of the Association, will shortly be circulated to all plant taxonomists known to be working on tropical Africa. Anyone interested, who does not receive the full account by the end of May 1951 is asked to communicate with the Secretary, Mr. D. R. Meikle, The Herbarium, Royal Botanic Gardens, Kew, Richmond, Surrey.

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